THE CONSUMPTIVE USE PERMIT PROCESS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT: AN INSTITUTIONAL ANALYSIS

By

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KEY TO ABBREVIATIONS, ACRONYMS, AND SYMBOLS

A	Action or strategy space
A_i	Action or strategy set for the ith player or consumptive use category
ACCEPPAA	Applicant acceptance of PAA (yes/no)
ACTION	Applicant needed to take further action (yes/no)
AGE	Age of District board or staff member (years)
AGEOPER	Age of agency or business operation (years)
AGERESP	Age of survey respondent (years)
AGR	Agricultural consumptive use category (CLASS=1)
AGRRANK	Rank of AGR in difficulty of obtaining water requested on application
APPCHANG	Changes made by applicant on application after PAA (yes/no)
ATT_j	Attitude on one of 27 parts to question 1 on survey, for a District board or staff member (1 through 5)
BASIN	River basin in which a CUP is located
BEGWD	Date of first water withdrawal, whether under permit or not (YYMM)
BOARD	Water Management District governing board (CLASS=3)
CLASS	Consumptive use class or category (0,1,3)
CONTACTS	Sum of all PRECON and POSTCON that an applicant used (number of total contacts)
COSTCASH	Cost to applicant: out-of-pocket and productivity (dollars)
COSTHELP	Cost to applicant: help outside his organization (dollars)

COSTTIME	Cost to applicant: lost time (days)
COUNTY	County in which a CUP is located
CS	Consumers' Surplus
CUP	Consumptive Use Permit
CUPATT_j	Attitude on one of 27 parts to question 1 on survey, for a CUP applicant or holder (1 through 5)
D	Demand curve
DATEISSU	Date that a CUP was issued (YYMMDD)
DER	Florida Department of Environmental Regulation
DISTIMP	Importance of distributive criterion in deciding whether to grant a CUP
DISTRANK	Rank of distributive criterion in deciding whether to grant a CUP
ECONIMP	Importance of economic criterion in deciding whether to grant a CUP
ECONRANK	Rank of economic criterion in deciding whether to grant a CUP
EDUC	Education level of person who filled out application, or of District staff/board member
EVIDENT	Evidentiary status of a CUP (yes=presence of protests and no=absence of protests)
FAA	Final Agency Action
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
GPD	Gallons per day
GRWDPTS	Number of groundwater withdrawal points
i	ith consumptive use category
INCOME	Business income, agency budget, or income of District board member (dollars)
IND	Industrial consumptive use category (CLASS=0)

INDEXAV	Ratio of PERAVWD to REQAVWD (unitless)
INDEXMAX	Ratio of PERMAXWD to REQMAXWD (unitless)
INDRANK	Rank of IND in difficulty of obtaining water requested on application
MB	Marginal benefit
MC	Marginal cost
MEETINGS	Applicant attended at least one WMD meeting (yes/no)
MGD	Million gallons per day
MSDIFATT	Mean square of difference in attitudes (unitless)
N	Set of players
NRSTIP	Number of stipulations on a CUP
NRUSES	Number of consumptive uses on a CUP
NSB	Net social benefit
NWFWMD	Northwest Florida Water Management District
OC	Opportunity cost
ORGTYPE	Type of organization that holds a CUP
OVRESTIM	Applicant felt it was necessary to overestimate the amount of water needed on CUP application (yes/no)
OWNER	Owner and applicant are the same (yes/no)
P	Price or value of water
PAA	Proposed Agency Action
PERAVWD	Permitted average daily withdrawal (x1000 GPD)
PERMAXWD	Permitted maximum daily withdrawal (x1000 GPD)
PERSIMP	Importance of personal experience criterion in deciding whether to grant a CUP
PERSRANK	Rank of personal experience criterion in deciding whether to grant a CUP
Π	Payoff function

POSTCL	Class of consumptive water use specified after PAA
POSTCON	Contacts used by applicant after PAA (number)
POSTPAA	Percent contacts after PAA, perceived by District board and staff
PRECL	Class of consumptive water use specified before PAA
PRECON	Contacts used by applicant before PAA (number)
PREFAA	Percent contacts before FAA, perceived by District board and staff
PREPAA	Percent contacts before PAA, perceived by District board and staff
PS	Producers' surplus
PUB	Public-supply consumptive use category (CLASS=0)
PUBRANK	Rank of PUB in difficulty of obtaining water requested on application
RENEW	CUP is expected to be renewed (yes/no)
REQAVWD	Requested average daily withdrawal (x1000 GPD)
REQMAXWD	Requested maximum daily withdrawal (x1000 GPD)
RURAL	County in which CUP is located is considered rural (yes/no)
S	Supply curve
SAMEVIEW	Same views are held by other members of staff/board
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
SRWMD	Suwannee River Water Management District
STAFF	Water Management District CUP staff (CLASS=3)
STRAT3	Sum of WAIVELIM, OVRESTIM, and MEETINGS (maximum is three yes responses)
SURFCODE	Code used to specify surface withdrawal size
SURWDPTS	Number of surface water withdrawal points

SWFWMD	Southwest Florida Water Management District
T	Set of all time periods (years)
t	A specific time period (year) within the set T
TC	Transactions costs, herein given by the sum of COSTCASH and COSTHELP (dollars)
TECHATT	Attitude toward technological change, as a composite of REASON 1 and REASON 2
TECHIMP	Importance of technical criterion in deciding whether to grant a CUP
TECHRANK	Rank of technical criterion in deciding whether to grant a CUP
TIMEOCCU	Time in occupation for District board member (years)
TRANSFER	CUP has been transferred to someone else (yes/no)
USEWATER	Water specified on CUP is actually used (yes/no)
W	Quantity of water
WAIVELIM	Applicant waived 120-day time limit (yes/no)
WELLCODE	Code used to specify well withdrawal size
WMD	Water Management District
WMDCHANG	Changes made by District on CUP after PAA (yes/no)
WORKBD	Work relations with board
WORKOFFI	Work relations with other officials
WORKSTF	Work relations with staff

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THE CONSUMPTIVE USE PERMIT PROCESS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT: AN INSTITUTIONAL ANALYSIS

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An institutional approach was used to describe and analyze the major aspects of the Consumptive Use Permit (CUP) process in the Southwest Florida Water Management District (SWFWMD) during 1976-1984, to improve understanding of changes in water rights, and how to obtain a water permit, in Florida.

This approach was guided by a game theoretic framework. The eight aspects of a game (rules, nature of competition, players, strategies, payoffs, sum, form, and time periods) provided structure for descriptive and predictive analyses.

Primary data were obtained via a mail questionnaire sent to 434 CUP applicants (agricultural, industrial, and public supply) and to 126 SWFWMD board and staff members. The overall response rate was 32.7 percent (183 out of 560).

Secondary data on CUPs from the SWFWMD were obtained from a computerized data base at the SWFWMD.

The CUP process in the SWFWMD during the period of interest was in part an information channel, reflected in a set of rules for interaction among participants in the game. The applicant, WMD staff, and WMD board all exchanged information. From the WMD's point of view, the information or data thus collected were used to make rational technical decisions in a regulatory environment. From the applicant's point of view, the information exchange resulted ultimately in a CUP and the income stream that would flow from that CUP. Water scarcity and competition for water did appear to be of concern for the future but were not perceived by many players to be important in the periods of analysis. Nevertheless, effort was spent by applicants to ensure future access to the resource. Quantity of water requested did much to explain the quantity of water granted on a CUP. Overall, the consumptive use permitting process appears both equitable and economically efficient.

An iterative environment-rich game, or supergame, is most likely being played at a higher level than the one selected for the present study, since the evidence suggests that a highly cooperative scenario prevailed between applicants and District players, with little alteration of rules or positive and/or negative feedback at that level of interaction.

CHAPTER I
INTRODUCTION

Statement of Problem

An ongoing water-rights struggle involving agricultural users, industrial users, public-supply users, and several governmental agencies has been taking place in Florida during the last several years. Who will use the available water, where it will be used, and how it is to be used have all been central issues in this struggle. Florida newspapers have reflected these concerns,[1] especially for the jurisdiction of the Southwest Florida Water Management District (SWFWMD).[2]

The SWFWMD covers "approximately 9,760 square miles in west central Florida including all or parts of 16 counties and is contained within two natural topographic regions in

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[1] The historical record in regional newspapers contains many editorials and reported stories that are evidence of this struggle and related issues. See, for example, "'Water Stealing' Attacked" [Gainesville Sun, Sept. 13, 1973, 10A], "Pipeline Purloiners" [Gainesville Sun, May 13, 1976, 4A], "Pumping of Suwanee Water South Discussed by Planners" [Gainesville Sun, Aug. 26, 1977, 5A], "Will Water We Take for Granted Always Be There?" [Gainesville Sun, Dec. 18, 1977, Supp. 3], "Experts Say State Faces Water Crisis" [Gainesville Sun, Sept. 12, 1979, 8A], and "Lewis Pushes Legislation to Better Control Water Problems" [Gainesville Sun, Mar. 8, 1980, 5A].

[2] Please refer to Key to Abbreviations, Acronyms, and Symbols, pp. xv-xix.

Florida-the Coastal Lowlands and the Central Highlands" [Southwest Florida Water Management District, 1977, 18].[3] The population was 1.2 million in 1961, when the SWFWMD was created, and had grown to 2.2 million by 1976. The population is projected to be 4.9 million in the year 2020 [Southwest Florida Water Management District, 1977].

Historical and anticipated freshwater consumptive use data for the SWFWMD are summarized in Table 1, which was compiled from data in several sources [Southwest Florida Water Management District, 1977; Rodan and Lynne, 1981; and Duerr and Sohm, 1983]. Agricultural demand is projected to nearly double, with domestic demand increasing more than threefold from the early 1970s to 2020. While industrial demand is projected to decline, on net there is a substantial increase projected by 2020.

Florida's subtropical climate also gives rise to a difficult hydrologic system to operate within. The climate is characterized by a "feast and famine" temporal pattern of rainfall, both from season-to-season and with respect to year-to-year deviations [Shih, 1980]. While there are usually plentiful reserves, especially in underground aquifers, severe droughts cause short term hardships. In fact, there were several water shortfalls in the decade of

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[3] The 16 counties in the SWFWMD are Charlotte, Citrus, DeSoto, Hardee, Hernando, Highlands, Hillsborough, Lake, Levy, Manatee, Marion, Pasco, Pinellas, Polk, Sarasota, and Sumter.

Table 1. Freshwater demand and supply, Southwest Florida Water Management District, in million gallons per day (MGD).

	Quantity (MGD)				
Type of Demand or Supply	1970	1975	1977	1981	2020
Agricultural demand[a]	461	491	451	614	860
Industrial demand[b]	400	389	338	314	215
Domestic demand	--	282	293	364	920
Urban	173	213	238	318	--
Rural	--	69	55	46	--
Thermoelectric power consumptive demand	--	18	--	--	250

[a] Includes livestock and irrigation.

[b] Includes phosphate mining, pulp and paper processing, chemical production, limerock mining, citrus processing, food processing and air conditioning.

SOURCES: Southwest Florida Water Management District [1977], Rodan and Lynne [1981], and Duerr and Sohm [1983].

the 1960s and the early 1970s, likely a contributing factor to passage of the 1972 Florida Water Resources Act [Maloney et al., 1979], referred to statutorily as F.S. Chp. 373.

The high evaporation and transpiration rates due to the near tropical temperatures can create havoc with all types of flora and fauna within relatively short periods of time without rainfall. This fact, combined with the main use being during the winter dry season, due to both agricultural irrigation and increased tourist activity, can easily result in deficits. These fundamental aspects, driven by the character of the climate, are confounded in their complexity by a rapid influx of permanent residents, all of which has contributed to a great deal of unrest about Florida water rights and allocation in recent years.

Given the complexities of water demand and supply that exist in Florida, the state legislature apparently believed that a more "rational" system was needed.[4] The 1972 legislation provided for the creation of the present Water Management Districts (WMDs). Water-related issues would now be dealt with in the administrative arena of the WMD system and not in the adversarial environment of the court system.

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[4] In the not too profound, but still accurate words of Harl, a noted legal and economic expert on water, "if demand exceeds supply geographically, seasonally or cyclically, water management under a system of rational allocation is needed" [1973, 37], above and beyond what can be accomplished in the common law and courts. The interesting question is the meaning and characterization of what is "rational," which is, in part, a motivating force for this study.

Thus, a significant change in the institutional setting occurred at that time. The 1972 legislation specified new rules by which the access to water is acquired.

The resulting process for influencing the rules, and for obtaining a right to use water under those rules, can be viewed as a game, played at times in an obvious fashion and at other times more subtly. The playing of this game may be expected to continue in the years ahead, with various individuals and groups vying for rights to use water in all kinds of economic endeavors. Some have already perceived that the shadow price of water will increase under the expectation that water will become more scarce in the future. Such perceptions likely motivate individuals and groups to establish water rights.

The 1972 legislation forms the bounds for a new game, with the stakes being control of the water resource and the potential for considerable influence on the future economic growth of the state. In effect, the participants in this game are deciding the shape of Florida's economic system as decisions are made on who should have the water and how society is to be organized to distribute the limited supplies. The game reflects an ongoing process of institutional change, evolutionary in nature, with the participants likely pursuing rules beneficial to their situation, as well as actual current and future water rights through permit acquisition.

Knowledge is needed about how the game is won (and lost). Such information will enable those in the process, or those wishing to enter, to better understand how to play. The net result should be a more efficient and equitable allocation of the income, wealth, and power associated with the rules for gaining a permit, as well as the permit proper, due to more information being available to the process as the result of studies such as this one. An assessment is also needed as to whether the current permitting process is economically efficient and equitable.

Objectives

The overall purpose of the study was to improve understanding of recent changes in the institutional setting pertaining to water quantity and of the current consumptive use permitting process in Florida, and thereby provide insights into how access to water is obtained. The situation in the SFWMD is used as a case study. The specific objectives were

1. to discover the major institutional, rule changes affecting the consumptive use permitting process;
2. to identify the working rules of the consumptive use permitting process, both formal and informal;
3. to determine the degree to which the process of rule change and of gaining a permit was cooperative or noncooperative;
4. to determine the major characteristics, including attitudes, of the game players;

5. to identify the strategies and "game plans" used by participants in the game including a description of interactions among the applicants, governing board, district staff, and others in the permit process; and

6. to characterize the payoffs from game participation, and isolate the factors resulting in various degrees of payoff.

The major emphasis was on the actual permitting process, in order to improve knowledge of, and provide information about, the forces involved in obtaining a permit.

Organization of Dissertation

The review of literature is presented in Chapter II. Chapter III is used to explain the theoretical framework. The data base, methods, and empirical modeling are described in Chapter IV. Chapter V presents the results of the study. Discussion and conclusions are found in Chapter VI. Detailed supplemental presentations are found in Appendices A through D.

CHAPTER II
LITERATURE REVIEW

Entropy, Information, and Living Systems

The universe proceeds from cosmos to chaos. Order and structure become disorder and randomness over time. This central concept derives from the Second Law of Thermodynamics, also referred to as the entropy law. Chase [1985], Georgescu-Roegen [1971], Randall [1975b], Rifkin [1981], and Schotter [1981] are among those who have addressed this issue in economic terms.

Ilya Prigogine, 1977 Nobel Laureate in Chemistry, has indicated that systems may arise naturally and passively increase order and complexity [Campbell, 1982]; however, this apparently occurs within a subset at the expense of the larger set. Thus, while entropy increases to a global maximum throughout the set, neg-entropy may increase locally within the subset. These subsets include living systems.

These life processes may acquire sentience over time and actively increase their store of information or order at the expense of the rest of the universe. Sentient beings may vie with each other for this information, seen in terms of tangible and intangible resources such as space, energy, knowledge, or raw physical inputs. If this occurs, they will be in conflict with both the universe and with each other.

The V-A-B Hierarchy

With sentience comes value systems, as seen in the case of homo sapiens. Values and attitudes serve to form the basis for certain behavior, giving a three-tiered hierarchy of values, attitudes, and behavior (V-A-B).

Rokeach [1973, 5] defines a value as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" and a value system as "an enduring organization of beliefs concerning preferable modes of conduct or end-states of existence along a continuum of relative importance." He indicates that

> to say that a person has a value is to say that he has an enduring prescriptive or proscriptive belief that a specific mode of behavior or end-state of existence is preferred to an opposite mode of behavior or end-state. This belief transcends attitudes toward objects and toward situations; it is a standard that guides and determines action, attitudes toward objects and situations, ideology, presentations of self to others, evaluations, judgments, justifications, comparisons of self with others, and attempts to influence others. Values serve adjustive, ego-defensive, knowledge, and self-actualizing functions. [Rokeach, 1973, 25]

He presents a set of 36 basic "instrumental" values (that refer to modes of conduct, or means) and "terminal" values (that refer to end-states of existence, or ends).[1]

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[1] The instrumental values are ambitious, broadminded, capable, cheerful, clean, courageous, forgiving, helpful, honest, imaginative, independent, intellectual, logical, loving, obedient, polite, responsible, and self-controlled.

Values are global beliefs that transcend specific objects and situations, while attitudes are combinations of values that focus on objects and situations in a specific sense. Rokeach [1979, 72] states that "behavior may be viewed as a manifestation of attitudes and values." Grunig [1983] discusses the attitude-behavior controversy, which addresses the inconsistencies that occasionally arise between these two parts of the V-A-B model. This, however, is herein seen as stemming from our rudimentary understanding of the V-A-B hierarchy, and not necessarily as a shortcoming in the theory of the hierarchy itself.

Social Institutions

Social institutions are part of human behavior and are manifestations of attitudes and, in turn, values. Thus, we find in common parlance that an institution is "a significant practice, relationship, or organization in a society or culture" [Webster's New Collegiate Dictionary, 1973, 599]. Commons suggests that "we may define an institution as Collective Action in control of Individual Action" [1961, 69]. According to Schmid, institutions are "sets of ordered relationships among people which define their rights,

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The terminal values are a comfortable life, an exciting life, a sense of accomplishment, a world at peace, a world of beauty, equality, family security, freedom, happiness, inner harmony, mature love, national security, pleasure, salvation, self-respect, social recognition, true friendship, and wisdom [Rokeach, 1973]. These 36 values have been distilled from a list of more than 18,000 values.

exposure to the rights of others, privileges, and responsibilities" [1972, 893]. Schotter states that "a social institution is a regularity in social behavior that is agreed to by all members of society, specifies behavior in specific recurrent situations, and is either self-policed or policed by some external authority" [1981, 11]. In a more mathematical, symbolic fashion, Schotter also notes that

> a regularity R in the behavior of members of a population P when they are agents in a recurrent situation Γ is an institution if and only if it is true that and is common knowledge in P that (1) everyone conforms to R; (2) everyone expects everyone else to conform to R; and (3) either everyone prefers to conform to R on the condition that the others do, if Γ is a coordination problem, in which case uniform conformity to R is a coordination equilibrium; or (4) if anyone ever deviates from R it is known that some or all of the others will also deviate and the payoffs associated with the recurrent play of Γ using these deviating strategies are worse for all agents than the payoff associated with R. [1981, 11]

Roberts and Holdren similarly state that

> an institution will be defined as a system of rules applicable to established practices (or situations) and generally accepted by the members of a social system. These guidelines of interaction may be either explicitly delineated by laws, charters, constitutions and so forth or they may be implicit to a particular culture, such as customs, mores, generally accepted ethics, and so forth. The essential point is that an institution specifies consequences of individual or group action which can be expected. Given an existing institution, an individual or group knows to some extent the reaction its activities will evoke. [1972, 110]

Finally, Hayami and Ruttan [1985, 94] argue that

> institutions are the rules of a society or of organizations that facilitate coordination among people by helping them form expectations which each person can reasonably hold in dealing with others. They reflect the conventions that have evolved in different societies

> regarding the behavior of individuals and groups relative to their own behavior and the behavior of others.

All of these definitions lead toward recognition that an institution is a set of socially santioned rules about individual behavior within a larger society. Human values are a key force in the resulting set of institutions guiding such behavior.

Functions of Institutions

Institutions function in part as information channels that are used by society to reduce conflict, risk, and uncertainty (and in the process increase order and its attendent certainty), in keeping with, and constrained by, the value sets held by society. Randall makes the case well, when he notes that

> institutions express a society's value system and give it effect in the form of working rules. As such they tend to shape the individual's habits of thought and action and his expectations. However, in order to be reasonably stable, institutions must be broadly consistent with the ethical values of the society. [1978, 12]

Schotter [1981] elaborates on the role of institutions by identifying four types of social problems which they are used to address, namely the coordination problem, the prisoner's dilemma problem, the inequality-preserving problem, and the cooperative game problem. The method of creation is either organic or deliberate. Property rights function as coordinating mechanisms as well as inequality-preserving institutions, and may be created organically or deliberately.

The function of an institution may be better understood by considering the hierarchy of decision-making offered by Ciriacy-Wantrup [1967]. There are three levels of decision-making, each of which may be studied with regard to its structure, function, and performance. The first level is concerned with decisions about control of inputs, outputs, and other quantitative measures; the producer and consumer in the market-place (both agricultural and non-agricultural) are the decision-makers. The second level forms the institutional framework within which the first must function. In the United States, the executive, legislative, and judicial branches of government are generally the decision-makers at this level. The third and highest in the hierarchy is the constitutional or policy level and forms the framework within which the second must function. In the United States, the federal and state constitutions form the essential guidelines. All of these components represent a set of intricate rules within which economic activity proceeds.

In a representative democracy, legislative bodies are given a public mandate to create various statutes and codes, that in turn authorize the existence of regulatory agencies to meet social goals. Randall [1981] states that the maximization of welfare is the highest economic goal to which a society may aspire. This welfare may incorporate such goals as economic efficiency, equity of benefit and cost distributions across specific sectors, optimal economic stability and risk, an optimal growth path, and optimal intergenerational (intertemporal) effects, and may require weighting of goals. Greene indicates that "the problem of maximizing welfare is one of combining economic efficiency with distributional equity in such a manner that the well-being of the individuals in a community is maximized" [1970, 2]. This entails the anticipated movement toward the "constrained bliss point," which is the theoretical point of tangency between the "grand utility-possibility frontier" and the "social welfare function." At this point, one obtains both economic efficiency and equitable distribution [Bator, 1957]. Regulatory activities may or may not move society closer to such bliss points.

Institutional Change

Mitnick [1980] outlines a general framework for a policy-making process. The five stages in this process are access, decision, administration, implementation, and impacts/effects. In each stage, he draws our attention to the agents involved and their strategic behavior, the format and location of the process, the contextual/situational conditions, and the dynamics involved. The outline presented by Mitnick is offered only as a rough guideline, and is not thought to be comprehensive.

Furthermore, Mitnick adds to J. Q. Wilson, who conceptualizes interest as a relationship of perceived benefits and costs in a society, due to a regulatory policy. Wilson identifies three patterns: (1) concentrated benefits, diffused costs, (2) concentrated benefits, concentrated costs, and (3) diffused benefits, concentrated costs. Mitnick points out that Wilson ignores the fourth pattern. To the above we may therefore add (4) diffused benefits, diffused costs. Qualitative and/or quantitative differences may create the need for further disaggregation, beyond the simple 2 x 2 matrix presented here.

Davis and North [1971] suggest that when private interests perceive potential net gains to be had from institutional change, such interests or economic agents will endeavor to see this change brought about and implemented. These potential profits (expressed as benefits minus costs, including the costs of bringing about the institutional change needed) are generated by five sources: economies of scale, internalized externalities, the overcoming of risk aversion, reduction of transactions costs, and the redistribution of income in favor of the interest groups. Admittedly, Davis and North's approach to institutional change that considers only economic forces (i.e., potential profits) is quite narrow in scope, but it does provide an important insight.[2]

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[2] Hayami and Ruttan [1985] list five approaches to political economy that have attempted to include institutional change as an endogenous force. These are (1) the theory of property rights, (2) the theory of economic regulation, (3) the theory of interest group rent-seeking, (4) the liberal-pluralist theories of government, and (5) the neo-Marxian theories of the state. These are all viewed,

By combining the above concepts, it may be hypothesized that Wilson and Mitnick's 2 x 2 matrix suggests one scenario that would very likely lead to institutional change, in keeping with Davis and North. That is, institutional change is likely to be brought about when benefits are concentrated and costs are diffused, e.g., in the case of an interest group and society at large. The concept of a time lag is also found in Davis and North. As potential net benefits increase, one may expect an interest group to work more diligently toward rapid implementation of the institutional change.

It may be hypothesized that institutions change as a result of changes in information, values, technology, and/or conflict. This may be brought about in at least three ways. First, as society gathers more information, the V-A-B structure may change, and thereby influence or constrain the social institutions that are created. Second, as more information is gathered, technology (viewed as the operationalized fraction of the total information possessed by society) may increase and lead to potential profits;[3] the

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however, as being essentially NC in nature, since the market, property rights, and the state remain as the focal points, generally with economic forces driving all human activity.

[3] Examples of changes in technology that have influenced Florida include transportation (such as improved road systems, automotive technology, and aviation technology), vector control and medicine (such as the control of mosquitoes, malaria, and yellow fever), air conditioning technology (that developed during and after World War II), and

potential for economic net gain would then bring about institutional changes as suggested by Davis and North. Third, information changes may increase levels of conflict in society, which will respond by creating the appropriate institutional arrangements to bring the conflict level back to normal, in a feedback loop fashion.[4]

For a number of years, Ruttan and Hayami have pursued the concept of institutional change that is induced by the perception by economic agents of positive net benefits to be had from such change.[5] The central construct in their model involves demand and supply, wherein the demand for institutional innovation is a function of relative resource endowments and of technical change, and the supply of institutional innovation is a function of social science

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engineering technology related to control of water movement in the state (such as in flood control, pump technology, and irrigation technology).

[4] Gruchy [1972, 293] states that "according to the neo-institutionalist interpretation tension and conflict are normal features of the adjustment process through which the economic system passes." John R. Commons similarly assumed that material scarcity exists in the world; this leads to conflict, and institutions evolved to resolve such conflicts [Gonce, 1971].

[5] As they have stated, "Our view . . . reduces to the hypothesis that institutional innovations occur because it appears profitable for individuals or groups in society to undertake the costs. It is unlikely that institutional change will prove viable unless the benefits to society exceed the cost" [Ruttan and Hayami, 1984b, 68]. For their most recent thoughts concerning a model of induced institutional change, which follows close on the heels of a model of induced technical change, see Ruttan [1978], Ruttan [1984], Ruttan and Hayami [1984a], Ruttan and Hayami [1984b], and Hayami and Ruttan [1985].

knowledge and of cultural endowments (including religion and ideology). They admit that the supply aspect is less well understood than the demand component of the model. The Ruttan-Hayami model of induced institutional change relies most heavily upon the hedonic-based terminal values (such as "a comfortable life," "family security," and "pleasure") taken from the list of 36 instrumental and terminal values. The other 33 or so values are held ceteris paribus within the framework of analysis.

Beckford [1984, 78] expresses his doubts about this model by stating that

> I am most concerned with the superficiality of the model of induced institutional innovation. It is totally impossible to explain institutional reform in purely economic terms, as Ruttan and Hayami have tried to do. . . . [W]e need to examine the social and political (not to mention the psychological and cultural) dimensions of the process of institutional change.

Randall [1978] adds that the induced institutional innovations hypothesis, developed within the property rights-public choice school, is untestable. However, Hayami and Ruttan also describe an open pattern model that "maps the general equilibrium relationships among resource endowments, cultural endowments, technologies, and institutions" [1985, 110].[6] They suggest that such a model "helps to identify areas of ignorance"; for example, "our capacity to model and test the relationships between cultural endowments and either technical or institutional change is relatively weak" [1985, 111].[7] Hayami and Ruttan "insist on the potential significance of cultural endowments, including the factors that economists typically conceal under the rubric of tastes and that political scientists include under ideology" [1985, 114].

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[6] Note that "the recursive multicausal relationships of the pattern model imply that the model is always 'open'" [Hayami and Ruttan, 1985, 110] because, according to Fusfeld [1980, 33], "it can never include all of the relevant variables and relationships necessary for a full understanding of the phenomena under investigation."

The pattern model suggested by Ruttan and Hayami does provide an overview that the institutional analyst should consider, by indicating the interrelationships that are likely to prevail among its four components. Yet such a model, coupled with their model of induced institutional innovation, must be seen as an early attempt that does little to operationalize the analysis of social institutions, in terms of their creation, processes, and demise.

Property Rights and Water Law

Randall [1978] presents a schema that shows the interrelationships between the neoinstitutional and other economic schools of thought, with respect to property. He directs our attention to the importance of the interrelationships between property institutions and economic performance. Additionally, he describes a nonattenuated property-rights structure, which forms the benchmark for further discussion of water rights [Randall, 1975a]. With nonattenuation, the property rights are substantial, allowing considerable freedom to those holding the rights. A nonattenuated rights structure has these characteristics: (1) the set of rights is completely specified, (2) the rights are exclusive, (3) the rights are enforceable and enforced, and (4) the rights are transferable. Deviation from nonattenuation moves one toward attenuated or weakened rights.

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[7] Values, attitudes, tastes and preferences, and utility are all included (explicitly or implicitly) within the cultural endowments component of the Ruttan-Hayami pattern model. It is likely that this component, in turn, will be modeled by the central features of the V-A-B hierarchy.

Ciriacy-Wantrup states that "water policy may be regarded as a set of decision rules in a multistage decision process" in which "a sequence of decisions extends over time and space" [1967, 179]. He points out that "the first step in . . . a study of water policy is to identify the system or systems in the control of which decision rules are sought" [1967, 179]. He describes the system in question as "a mixed groundwater-surface water system" and adds that "appropriate institutional structures . . . are a necessary and frequently sufficient condition for its functioning" [1967, 180]. Krutilla [1981] and McDowell [1980] call for improved characterization of inputs and outputs in future analyses. McDowell [1980] also states that there is great need to analyze institutions in effect at the local government level. Beattie _et al_. [1971], Cox and Shabman [1982], Golubev and Biswas [1979], Hartman and Seastone [1970], Howe and Easter [1971], Kiker and Taylor [1979], and Mercer and Morgan [1978] are representative of the efforts in recent years to qualify and quantify alternative institutional arrangements for water allocation within and across both hydrogeological and political boundaries.

Trelease [1965] discusses the most salient features of water law and the interrelationships that exist between property rights, economic forces, and public regulation, all of which are based on law.[8] He suggests [1965, 2] that

> water law should provide for maximum benefits from the use of the resource, and this end should be reached by means of granting private property rights in water, secure enough to encourage development and flexible enough for economic forces to change them to better uses, and subject to public regulation only when private economic action does not protect the public interests.

The ultimate goal, then, for water resource law (and which also lies behind government, law, and human action in general) is that of maximizing or perhaps optimizing net social returns, aggregate social satisfaction, or social product. This allows the consideration of both private and public benefits [Trelease, 1965]. Furthermore, "an ideal water law should give a water right those characteristics that will encourage and enable people to make the best decisions as to water use in their own interests and hence ultimately in the public interest" [Trelease, 1965, 8].

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[8] This is due to the fact that "the law . . . creates property rights and controls their exercise by public regulation [and] provides the basis for the operation of economic forces" [Trelease, 1965, 6].

Trelease [1965] discusses the attributes of water rights that will best serve the private and public interests. Such rights must be (1) defined; (2) placed on record; (3) determined in some ready manner by rules that are known or discoverable, stated with certainty, and easily translatable by the user; (4) specified in quantity and purpose; (5) secure in duration of right; (6) transferable; (7) mobile (not restricted by type of user or place); and (8) at the same time, flexible in purpose of use.

Milliman [1959, 41] states that "a system of water law should place strong emphasis upon the institutions of private property and the market process for the efficient allocation of water resources as contrasted with centralized planning based upon administrative and judicial judgment." This contrasts markedly with the views of Ciriacy-Wantrup and Bishop, who examine the social performance characteristics of various common property (res communes) institutions and conclude that they are "capable of satisfactory performance in the management of natural resources" and "might be helpful in the solution of present problems in natural resources policy" [1975, 721].

Maloney et al. [1980], in Chapter I, discuss several water-rights structures, including prior appropriation, riparian, absolute ownership, American Rule (reasonable use rule), and correlative rights (the "California Rule"). Prior-appropriation water-use doctrine, as used in the western states, has priority (in time) and beneficial use as its fundamental characteristics. Water rights in the west are generally perpetual, but may be lost or abandoned through non-use, and generally operate under a statutory and administrative framework. The states east of the Mississippi River generally espouse a riparian doctrine, which developed from English common law. This system is based upon land ownership, with such land adjoining surface watercourses, including lakes and streams. Conflict is generally resolved via litigation and adjudication within the court system. Separate provision is often made for groundwater rights.

The Institutional Setting for Florida Water Management

Under prior appropriation, such as used in the western U.S., water rights are not tied to ownership of land. Under riparian law, used primarily in the eastern U.S., water rights are specified for those parties having property adjoining bodies of water or watercourses. This specification generally includes the extent to which such parties may inflict negative externalities upon each other. Under administrative water law, such as followed in Florida, the rights of parties not immediately adjoining bodies of water or watercourses are also considered. This is accomplished via an administrative body that determines whether a proposed consumptive use is a reasonable-beneficial use, defined as "the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest" [Florida Statutes, 1985, 467]. As one proceeds from prior appropriation to riparian and then to administrative water doctrine, the view of water as a privately held good diminishes, and that of water as a commonly held good emerges. The nature of the private/ common property mix is evolving in the Florida administrative system.

Florida changed from a riparian system to an administrative-permit system in 1972, but as late as 1980, riparian aspects were still found in regions of Florida that had not yet implemented the permitting system authorized by the Florida Water Resources Act of 1972 [Maloney et al., 1980]. All five WMDs have now introduced the permit system. Additionally, Florida law integrates surface and groundwater permitting [Batie and Marshall, 1983] and incorporates some aspects of prior appropriation in its riparian-administrative allocation schemes [Maloney et al., 1980]. It should be noted that conflict resolution theoretically takes place within the forum of the administrative body, which is the WMD.

The present institutional arrangement in Florida water management, as regards the Florida Department of

Environmental Regulation (DER) and the SWFWMD, is best understood by first examining Chapter 373, Florida Statutes (F.S.), which is also known as the Florida Water Resources Act of 1972. Maloney _et al_. [1968] and Maloney _et al_. [1972] represent comprehensive introductions, especially since the latter was adopted almost in its entirety by the Florida legislature as the 1972 Act.

Chapter 373, F.S., created six WMDs in 1972. The Ridge and Lower Gulf Coast WMD was abolished in 1977, leaving Florida with its present system of five WMDs [Maloney _et al_., 1980]. The jurisdictional lines of the WMDs are drawn approximately along hydrologic, river-basin boundaries.

Section 373.016, Declaration of Policy, includes such nebulous terms and expressions as "proper," "beneficial," "preserve," "promote," "general welfare," and "greatest extent practicable." Legislation, from the words of the founding fathers to the present legislature in Tallahassee, is and should be rigid and yet flexible enough to be functional and allow for change. However, excessively flexible wording can create difficult interpretational issues, especially in terms of specifying regulatory goals [Wershow, 1979].

The DER and the WMDs are charged with serving as the agencies for implementation of Chapter 373, with the DER ultimately responsible for all quantitative and qualitative aspects of water in the state. The WMDs are to function under the aegis of the DER, with specified authority delegated to the Districts by the DER [Wershow, 1979]. The WMD of concern in the present study is the SWFWMD.

To understand the permitting system presently used in the SWFWMD, one must examine Chapter 373, F.S. (especially Part II), and Chapter 40D, Florida Administrative Code (F.A.C.).[9] Within the Resource Regulation Department of the SWFWMD is found the Groundwater Management Branch. As part of this Branch, the Processing and Records Section is responsible for processing and technical evaluation of CUP applications. A CUP is one of five types of permits issued in the SWFWMD. Specifics are given for each of the five permit types in Chapter 40D-2 through 40D-6, F.A.C. Additionally, a CUP is further categorized as agricultural (AGR), industrial (IND), public-supply (PUB), or any combination of these three. Issuance of CUPs in the SWFWMD began in January 1976, and as of the end of 1984, more than 6,000 active CUPs were on file at the SWFWMD for all consumptive use categories.

A CUP is an attenuated property right, giving the bearer the right to use but not the right to own the water. Also, periods of 6 or 10 years are generally specified for this right to use the water and a CUP may be altered by the

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[9] The F.A.C. contains administrative codes for all five WMDs. Chapter 40A corresponds to the NWFWMD, 40B to the SRWMD, 40C to the SJRWMD, 40D to the SWFWMD, and 40E to the SFWMD. The present concern is only with Chapter 40D.

SWFWMD in times of water shortage. Complete transfer (of all consumptive use rights shown on a CUP) is possible from one user to another, with only a name change required on the CUP, if approved by the governing board. Partial transfer of rights, however, requires a new CUP for both the prior user and the new user. At present, enforcement and exclusivity may be questioned, due to the difficulty of monitoring actual usage and the uncertainty concerning the location of water in space and time.

Administrative water law has been adopted in Florida. Water is viewed as a common property resource. Everyone has entitlement to the use of the water, but with no specified private rights, so no one is the owner of the water [Kiker and Lynne, 1979]. A landowner does not have constitutionally protected property rights concerning the water beneath his land, and no compensation is required for taking of water when it is used for a public purpose [Southern Reporter, 1979]. Those wishing to acquire water from the water-rich areas within a WMD are free to do so, subject to getting a permit from the WMD. Individuals in water-rich areas are incapable of protecting themselves against these nonresidents, except through having influence on the staff and governing board. Nonresidents would be acting within the confines of the law but who could nevertheless alter benefit/cost streams over time.

For example, nonresident withdrawals of water in the short run could create additional pumping costs for the residents in a water-rich area. Nonresident withdrawals of water in the long run could have effects on regional development or growth potential, assuming some upper limit exists on the sustainable yield of the water system. The potential for such interdependencies raises the specter of conflict among competing users and the need for early action in obtaining water rights through a CUP.

Game Theory and Institutional Analysis

Game theory essentially evolved as a well-defined body of mathematical theory with the formulations of von Neumann and Morgenstern in the late 1940s and early 1950s.[10] Gould and Ferguson [1980] suggest that a game is any situation in which two or more people compete, while Schotter states that

> a game is defined as a set of rules for a particular situation that delimits the actions available to the players (the agents engaged in the situation) and awards payoffs to them on the basis of the actions chosen. Each player has a set of actions or strategies from which to choose, which we will call his strategy set. The payoff he receives is determined not only by the strategy he chooses, but also by the strategies the other players have chosen. If the payoff to each player were independent of the actions or strategies of all the other players, the situation being investigated would not be called a game but, rather, would consist of a set of independent maximization problems-a situation of considerably less interest. [1981, 15]

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[10] The seminal text for game theory is that of von Neumann and Morgenstern [1953]. Several more recent authors have also provided overviews, such as Agrawal and Heady [1972], Chiang [1974], Gould and Ferguson [1980], Henderson and Quandt [1980], Luce and Raiffa [1957], Schotter [1981], and Shubik [1982].

The basic problem is the analysis of multiperson decision-making, with or without the original von Neumann and Morgenstern assumptions concerning a comparable and transferable utility or numeraire such as money [Shubik, 1982].

Schotter and Schwodiauer [1980] and Shubik [1975] present a variety of applications of game theory to empirical data. Examples of game theory employed in the social sciences include Berne [1963], Goffman [1969], and Steiner and Kerr [1976]. Such examples, taken from the fields of sociology and psychology, make extensive use of "story-telling" in their methodologies and are largely devoid of quantitative analysis. Uses of game theory in the military and political sciences may be found in Zagare [1984]. Social scientists, and economists in particular, have not utilized game theory for the analysis of institutional change. Game theory has not yet been employed to a great extent in non-market scenarios where natural resources are concerned.

Game theory has great potential as an analytical framework for quantitative institutional analysis. Mirowski [1981] criticizes game theoretic approaches to institutional analysis, but his view of game theory seems to be limited to the simple static framework that uses a money numeraire, and not the environment rich, iterative supergame discussed by Schotter [1981] and Shubik [1975 and 1982]. A game theoretic framework could explictly examine the rules, players, strategies, and payoffs, in either the static or dynamic (or evolutionary) sense. The importance of each of these components is quite clear in both the neoclassical and institutional economic literatures.

Directions from the Literature

The literature relevant to the issues of consumptive use rule change and the process of gaining a permit separates into two distinct classes, namely that on institutional change and that of game theoretic notions of how individuals interact in the pursuit of individual gain. The institutional change literature suggests that values and attitudes must be understood in order to predict changes in rules. Even more fundamentally, current and projected technological features may be important forces in directing changes in values and attitudes, more indirectly leading to a change in the rules. The game theoretic literature helps the focus on process, and how individual "players" might interact to get rule changes, as well as to win the game within any given set of rules. While not necessarily useful in a quantitative sense, because of the difficulty of quantifying the game strategies and payoffs, this body of theory provides a valuable framework for discussion of the elements of the process involved in gaining a permit. The latter will involve a great deal of action and reaction, which is fundamentally what game theory is all about. The law, and in particular the 1972 legislation, reflects the summation and summary of institutional change up to a point in time, and particular features have implicit certain winners and losers of the game. There are gainers and losers both at the time of passage and into the indefinite future, as the law is implemented through administrative rules, and action, through an on-going game.

CHAPTER III
THEORETICAL FRAMEWORK

The theoretical framework used in the present study integrated components of the Ruttan-Hayami model of induced institutional innovation and their pattern model that relates resource endowments, cultural endowments, technologies, and institutions. Game theory is used as the analytical framework, with the goal of operationalizing the theoretical framework in a dynamic sense. The importance of the induced institutional innovation model becomes apparent as the rules, players, strategies, and payoffs are examined, while keeping in mind the desire of specific economic agents (or players) to alter the rules of the game in their favor so as to increase their net gains (or payoffs) over time. The cultural endowments component, which is perhaps the least understood, is examined explicitly in terms of attitudes and behavior of the players. The roles of technology and conflict are also explicitly examined within the empirical setting.

There is a hierarchy of theories concerning human behavior, beginning with behavioral theory at the most general level, and proceeding to operations research, then decision theory, and finally to game theory at the most specific level [Hillier and Lieberman, 1980; Nagel and Neef, 1976].

The focus here was on the game theoretic description of behavior. The goal was to describe and analyze the behavior of a set of rational economic decision-makers over a given period of time, and relate such behavior to an environment-rich supergame that has been changing over time, as the players have iteratively interacted with each other as well as with the rules.

The Eight Parts of the Game

Each of the eight aspects of a game [Schotter, 1981; Shubik, 1982] is now discussed in turn, in both the theoretical sense and the empirical sense. That is, the connection is immediately made wherever possible between a given aspect of a game and what could be expected in the SWFWMD.

The Rules of the Game

The rules of the game are defined as those conditions and constraints that control the interaction of the players, including the conditions for participation (who may play), tastes, technology, initial endowments, laws, and distribution and information channels. Such constraints on the behavior of the players may be explicit or implicit. A game may be classed as environment-rich or environment-poor, based upon the extent to which rules may be changed or interpreted by the players [Shubik, 1975].

The rules of this game were given by federal, state, and local laws (especially Chapters 120 and 373, F.S., and Chapter 40D, F.A.C.), hydrogeology, technology, and views of water as an economic variable and as a resource that may or may not be represented in the laws. The last item is particularly difficult to incorporate into the analysis, since perceptions of a resource include aspects of quality, quantity, space, and time [Randall, 1981].

It was expected that the game was environment-rich. The players, directly or indirectly through their chosen representatives, were likely to have the ability to interpret and change the rules over time. Additionally, the game of concern was expected to be a game of strategy and not a game of chance, the former category involving skill, and the latter involving good fortune or luck.

The Nature of the Game Competition

The nature of the game competition is defined as either cooperative or noncooperative and is often closely tied to the rules of the game. If groups of players may form coalitions (communicate and create binding contracts) to coordinate their strategies, then the game is said to be cooperative. If the players may not, then the game is said to be noncooperative. Schotter stresses that "cooperative and noncooperative games differ from each other not because the players in one cooperate whereas in the other they do not, but because the communication and contracting possibilities within them are different" [1981, 15]. A two-person game is essentially noncooperative, but communication and cooperation must not be entirely ruled out even with two players.

The nature of this game competition was expected to be cooperative between the WMD and a CUP applicant, and either cooperative or noncooperative between CUP applicants. Communication channels and opportunities for cooperation were likely to exist between the WMD and the applicant, as well as within consumptive use categories, but not between consumptive use categories. That is, agricultural users would be expected to talk and work among themselves concerning water permit matters; industrial users, as well as public-supply users, were expected to do the same. It was unlikely, however, that agricultural and industrial users, for example, would have the opportunity or desire to cooperate, communicate, or form such coalitions.

The Players

The players are defined as a specified set N of rational decision-makers. They are individuals and/or groups having active roles in the game and facing various payoffs as a result of their own behavior combined with that of other players. The number is one-person, two-person, or n-person. Person means participating party, which may include a large number of individuals, as in the case of management and labor.

There are at least seven groups involved directly and indirectly in the permitting/water-use process. These groups are (1) the regulated parties (AGR, IND, and PUB applicants); (2) the regulators (WMD BOARD and STAFF); (3)

lawmakers and politicians at the state and local levels; (4) lobby and/or interest groups, which may be highly correlated to the regulated parties; (5) employees of the applicant; (6) private consultants, public consultants, and other information specialists; and (7) the voters at large.

The players considered in this game were the regulated parties and the regulators. Thus, only the AGR, IND, and PUB applicants, and the SWFWMD BOARD and STAFF were included in the analysis. This is not indicative of the importance of the other groups, but merely represents the need to focus on the two groups that were most accessible, given the time and funding constraints for the investigation. Additionally, a data base on the regulated parties was already in existence at the WMD.

It was assumed that the users of water interact directly with the SWFWMD, one at a time. Also, interaction within a category was thought to be likely, but interaction among categories unlikely. The game was therefore assumed to be two-person, since only the SWFWMD and one of the three user-categories were likely to be participating in a given game.

The characteristics of the players had to be ascertained, in order to accurately describe the players. The consumptive use category, age (of an individual entrepreneur or of the firm), education, income, scale of operations, status in the community, and other characteristics helped to distinguish among economic agents. Such characteristics were considered as explanatory variables in the payoff function, since it was not expected that regulated parties were perceived to be identical by regulators.

The attitudes of the players also had to be ascertained. This was partly due to the fact that attitudes comprised a special subset of player characteristics. Additionally, in an iterative, environment-rich supergame, attitudes concerning the eight aspects of the game (especially other players, rules, strategies, and the payoff function) could influence the payoff, as positive and negative feedback from player attitudes alters the game itself. Player attitudes were therefore elicited by the survey instrument, described in Chapter IV, with the expectation that such attitudes could be explanatory variables in the payoff function.

The firm is "defined as a legal entity that supplies either intermediate or final goods and possibly uses both variable and fixed inputs in the production process" [Just et al., 1982, 50]. The firms of concern were categorized as AGR, IND, and/or PUB in nature. Each category contained a number of three-digit subcategories defined by the SWFWMD, where PUB included 001 through 099, AGR included 100 through 599, and IND included 600 through 900.

The Strategy Space

The strategy (or action) space is defined as the set A of all n-tuples a, where

$$a = (a_1, a_2, \ldots, a_n) \tag{3.1}$$

and represents n strategy choices, each one selected from strategy sets A_1 through A_n. Strategy set A_i is possessed by the ith player and includes the types of action or behavior which may be utilized by the ith player, given the rules of the game. Although most models are static, dynamic models are possible, since strategies may be composed of a single action or a sequence of actions and can extend over several time periods.

Strategies were seen in the present game as taking place in two phases (within a negotiation stage, which is discussed below in The Integrated Framework): (1) before receiving the Proposed Agency Action (PAA) or "Terms and Conditions Letter" and (2) after receiving the PAA but before receiving the Final Agency Action (FAA) or the CUP.

The PAA and FAA terminology was created on October 1, 1984. Prior to that date, the applicant received a "Terms and Conditions Letter." Additionally, not everyone received an FAA, unless the board actions were materially different than what was indicated in the PAA. If the board actions were essentially the same as the PAA, the permit, not the FAA, was received by the applicant at the end of the process. The survey instrument (discussed in Chapter IV) reflected the existence of these two phases in the application process and elicited information concerning both phases.

The CUP applicant faced one of three possible outcomes, or payoffs, as specified in the PAA: (1) the WMD decides to grant the CUP exactly as requested, (2) the WMD decides to grant the CUP, but in a modified form, or (3) the WMD decides not to grant the CUP. In the first case, the applicant had a set of strategies before receiving the PAA and would only have a set of strategies after receiving the PAA if the PAA and FAA were different. In the second and third cases, the applicant had a set of strategies before and after receiving the PAA, even if the strategy was simply to accept the PAA. One might therefore expect that costs (in time and/or money) would be higher if outcome (2) or (3) occurred. Short run strategies selected would include one or more of the following:

1. contact individuals in the same consumptive use category;
2. contact family or friends;
3. contact a county extension agent;
4. contact a WMD staff member or board member;
5. waive the 120-day time limit for the application process, to give the WMD more time;
6. hire an attorney, engineer, or other consultants, if these individuals are not on staff;
7. attend monthly WMD board meetings to check on the progress of the application;

8. overestimate the amount of water needed, to provide a margin of safety;
9. make adjustments on the application form as needed, during the application process; and
10. attempt to align views with those of the WMD, especially on technological matters related to water acquisition and/or use.

Long run strategies might have included the formation of a regional water supply authority to benefit from potential economies of scale when working with WMDs or other governmental agencies. Economies of scale could result, for example, in aggregation of political influence and power, and distribution of legal, engineering, and other consultation costs.

The Payoff Function

The payoff function Π is "a function that assigns each player a payoff based on the strategy n-tuple chosen by the players" [Schotter, 1981, 15]. A payoff vector

$$\Pi = (\Pi_1(a), \ldots, \Pi_n(a)) \qquad (3.2)$$

is assigned to each n-tuple

$$a = (a_1, a_2, \ldots, a_n) \qquad (3.3)$$

where $\Pi_i(a)$ is the payoff to the ith player when a is chosen by the players. Players "confront one another in pursuit of . . . conflicting objectives" and "it is obvious that not all players' objectives can be simultaneously realized" [Chiang, 1974, 742]. Payoffs are necessarily expressed in terms of the objectives of the players, although no comparability (or numeraire) is assumed or needed. Because of equations (3.2) and (3.3), it is obvious that strategies had to be characterized and included as explanatory variables in the empirical payoff function.

One qualitative component of the payoff to the applicant was expressed in terms of participation in a political market process. That is, by having a CUP, one would become enfranchised and could now participate actively in the decision-making processes of the system.

The qualitative payoff to the WMD BOARD and STAFF might include one or more of the following:

1. The WMD can obtain an improved data base, in accordance with the technocratic system that is used in Florida. Doing things "by the book" may be important, and such a data base establishes that District actions have been conducted pursuant to statutory and administrative law.
2. The WMD can regulate in the present. Technology (such as irrigation) may be monitored and improved by use of a permit system, and the WMD knows who is using the water.
3. The WMD can regulate in the future. In the event of scarcity in future time periods, the WMD will be able to make decisions using the CUP data base that is being collected today.
4. The WMD can regulate access to the state's water resources.
5. The WMD can distribute information about water and the system when necessary.

Other arguments in the payoff function for a WMD, or any regulator, might also include independence from or non-capture by the regulated party, size of agency budget, minimum examination by legislative committees, minimum conflict or adjudication costs, time spent per task, or work load per unit of time.

The economic payoff to the applicant is the value of a CUP. The value of a CUP is a function of what may be done with the water. At any given point in time, this is the net present value or sum of the weighted net returns from the water across the time periods of interest.

Conceptually, raw freshwater as an input is transformed into processed freshwater as a capital output. This process involves several steps, such as pumping, purification, storage, and transportation via pipelines, or through irrigation systems to agricultural crops. Other inputs (land, labor, capital, and management) are also needed in this process. The processed freshwater output will generally be referred to as simply "water" (W) in the discussion that follows.

The resulting economic value is the sum of the producers' surplus (PS) and consumers' surplus (CS). PS is defined as the area above the supply curve and below the price line, while CS is defined as the area under the demand curve and above the price line [Just et al., 1982]. The sum of PS and CS is termed net social benefit (NSB) and is the payoff of the game.

It was likely that users possessed some information concerning demand (D) and supply (S) for their own uses. These agents also knew that a given strategy was associated with a given set of costs. One notable component of such costs is termed transactions costs (TC). Transactions costs need to be included with the production and opportunity costs that are explicitly a part of the S curve. The TC of a given strategy shifts the S curve upward, thus diminishing the NSB received by the user selecting that strategy. However, it was expected that higher TC would lead to a higher likelihood of gaining a permit.

It was hypothesized that applicants would display preferences for certain strategies, based upon the marginal benefits, marginal costs, and added costs of different strategies. Aggressive strategies might reap higher rewards in water availability, but net benefits could be lower due to the high costs of such aggressiveness. Some strategies were not available to a user simply because of the cost involved. Other strategies were not used because of players failing to perceive the true value of the NSBs, especially those component values in future time periods.

As strategies were considered and tried or rejected, and payoffs were seen by the players as being the results of these strategies, it was hypothesized that the game would change over time, due to changes in the payoffs. As potential payoffs increased, there would be induced changes in the rules by those that could benefit the most, especially through legislative changes that would become institutional changes in water management. The rules, as stated earlier, constituted binding constraints for the players in the game. Unlike a game of chess, however, positive and negative feedback loops were expected to exist between the players and the rules of this environment-rich game.

The Game Sum

The game sum is defined as either constant-sum or non-constant-sum. In a constant-sum game, the sum of the payoffs of the players at the end is a constant. A zero-sum game is a special case where the constant is zero. In a two-person zero-sum game, the gains of one player are exactly offset by the losses of the other player.

The game sum in the present game was hypothesized to be non-constant-sum in both the short run and the long run. Thus, gains and losses were expected to be unequal in most cases. Areas above and below the curves were not expected to be exactly equal for all players. This was especially true in the long run, due to changes in technology, tastes and preferences, and in the national and international economies of which the regional economy was a subset.

In a simple society, if NSB is gained by user B and lost by user A due to a water transfer or reallocation from user A to user B, then only one of three cases can result: (1) NSB loss in A is greater than NSB gain in B so NSB_{SOC} decreases; (2) NSB loss in A equals NSB gain in B so NSB_{SOC} remains unchanged; or (3) NSB loss in A is less than NSB gain in B so NSB_{SOC} increases. Based upon the assumption that the present game was non-constant-sum, it would be expected that case (1) or (3) would be the most likely to occur.

The Form of the Game

The form of the game is defined as either extensive or strategic (also viewed in the literature as "normal"). The Kuhn game tree is the accepted general-purpose model for the extensive form. The strategic form is generally represented by rectangular matrices of payoffs. The strategic form is often the most realistic in modeling political and economic competitive processes. In fact, "at the level of generality practiced in much of political science as well as in mathematical economics, the goal of accuracy in modeling may not only permit but even require us to avoid most of the detail with which the extensive form is concerned" [Shubik, 1982, 69-70].

In the analysis of the present game, however, the extensive form was favored because it allowed determination of the nature of the underlying process. The storytelling approach inherent in the extensive form integrated well with the neoinstitutional (NI) perspective regarding the examination of institutional processes, and considered the players, strategies, and payoffs that would be presented in the matrices of the strategic form.

The Time Period of the Game

The time period of the game is defined as the period or periods across time in which the first seven aspects are in effect. Time periods (t) in this game were the years 1976 through 1984. Data on CUPs began in 1976 (when the SWFWMD began issuance of CUPs) and ended in 1984, which was considered to be the present for analytical purposes in this study. The set of all t was given as T, and subsets of T were useful in the analysis in view of the fact that some time series data, especially on water-use categories, were not annual or required aggregation for statistical sampling.

The Integrated Framework

It was expected that AGR, IND, and PUB economic agents would first perceive the benefits and costs that would derive from the acquisition and use of water. They would then endeavor to bring about a system of water management that would maximize their benefits and minimize their costs. The attitudes of such agents would be expected to influence the process of innovation, as well as the final institutional form produced. Once the institution is in place, any changes in the benefits, costs, or attitudes would start the innovation process anew.

This view helped to offer hypotheses concerning the consumptive use permit process, which was regarded as having four stages. The following discussion of this process is couched in terms of how those involved in the use of water in the production of goods and/or services might interact with the process.

There were a number of conditions that had to be considered to truly understand the process at work, especially those that affected the nature, extent, and quality of the negotiations. These conditions could be placed within the following six categories: (1) personal values, ethics, and attitudes; (2) personal capability to wield power and influence in the process; (3) general and local economic conditions, pertinent to the particular water use being considered; (4) physical features of the production setting, including the hydrologic system in the area of the proposed use of water; (5) biological features of the same area; and (6) climatic and weather variables, as these pertained to the hydrology of the setting.

Stage One of the Process

The first stage in the process is likely a recognition on the part of the applicant/potential permit holder that the benefits of the permit would exceed the costs over the periods of water use. This perception is probably influenced simply by the fact that the agency or business has been around for a number of years and the value of the water has been established. For this group, it is highly likely that a permit would be pursued. Those not having these perceptions would simply not apply for a permit; this latter group was not included in the study.

There may also be various sources of information used by the organization at this point, such as from University of Florida extension services, irrigation equipment manufacturers, magazines, and neighbors. All of these could enter to influence the perception of the potential gains from having a permit. It could also be expected that some consumptive users would consider the longer run time periods and include beliefs about the future of the economic activity they were pursuing, especially with regard to the expected economic returns from that activity.

Stage Two of the Process

The second stage is the actual permit application and review process or the negotiation process. This stage is the main focus of the study. Here the applicant comes in contact with the WMD staff and governing board. The applicant may seek and obtain advice from county extension sources, consultants, and from the district staff. The applicant may also attempt to influence the final decision by contacting local and state politicians, as well as the district governing board. This negotiation process is, in fact, in a political market, as opposed to an economic market, with the ultimate payoff being the right to use a specified quantity of water over time and space, as specified in a CUP.

It is also at this stage that the conditions of the permit are decided, setting the upper bound of the firm's economic activity over the duration of the permit. Such conditions are found within the PAA or "Terms and Conditions Letter." That is, it might have been determined that the firm could have up to 10 inches for each of its 160 irrigated acres of citrus for 10 years. There might be several iterations in this process. For example, the applicant may have been told in advance of a board meeting that the permit would be denied. He could have then withdrawn the application, tried to renegotiate the terms, and then tried again at a later time. Some applicants may have simply given up at this time or appealed to other authorities for a review of the denial decision.

Stage Three of the Process

The third stage is usually a mere formality, at some regularly scheduled board meeting, where the permit is either assigned or denied. By the time the process gets to this point, all of the problems have been either worked out through the negotiation process or the applicant has simply been told that the permit would not be approved. Thus, the applicant receives the CUP if the decision is not materially different from the PAA, an FAA if the decision is materially different from the PAA, or a denial.

Stage Four of the Process

The fourth stage involves the decision to actually use water; this decision includes when, where, and how much. The economic payoff occurs within this stage. Objectives in using the water may have varied from user to user. For example, some users may have been trying to generate a profit, thus adding to the economic efficiency of the economy. Others might have been using the water in some "reasonable" manner, but primarily to keep the land in agricultural use until it could be sold. Whatever the motivation might be, this fourth stage is affected by economic conditions, weather conditions, and the conditions of the permit.

One of the permit conditions, which is a control variable for the District, is the drought frequency on which W_4 is set (see discussion below). It is also this stage that recurs, year after year, until the permit is to be renewed, at which time the whole process is started over again. As can be seen in the following, the value of the permit, and thus the payoff, could vary a great deal. The discussion refers to an AGR applicant but applies equally to the IND and PUB categories wherever the use results in a production output.

The demand curve D is the marginal benefit (MB) of having water W available for the irrigation of crops (Figure 1). Some of this water becomes available from rainfall (W_4), and to the extent this occurs, the economic supply function S_1 defined by the marginal cost of available water

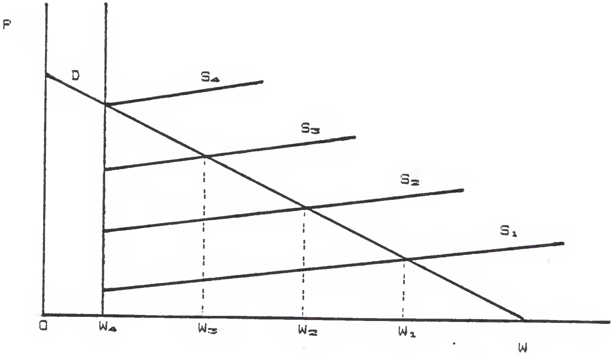

Figure 1. Demand for and Supply of Available Water.

(MC_1) is truncated at that level of W.[1] The irrigator can profitably use W_1 of water, with (W_1 - W_4) representing the amount of W desired as a condition of the water permit.

If there are transactions costs (TC) involved in gaining the water permit, the supply curve S_2 is given by (MC_1 + TC); the amount the firm can profitably use is reduced to W_2. It is the area under the D curve and above S_2 that represents the potential payoff from playing the game, as noted before. The applicant would request (W_2 - W_4) on the CUP application.

The WMD staff and governing board must consider the opportunity costs (OC) of giving this much water to agriculture. If OC is equal to OC_1, the supply curve becomes S_3, which is given by (MC_1 + OC_1); thus, the applicant would only get (W_3 - W_4) as a condition of the permit. These opportunity costs must be entered into the negotiation and considerations of permit assignment, because the governing boards are charged with concern for the "public interest" [Florida Statutes, 1985, 467]. However, the WMD must also insure an "economic and efficient" allocation [Florida Statutes, 1985, 467]; this necessitates the consideration of

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[1] It is helpful to think of W_4 as the minimum sustainable yield or the minimum quantity of W provided on a continuous basis by the hydrosphere (i.e., rainfall), if no additional W is available. This is the opposite of the maximum sustainable yield, which is the maximum quantity of W provided on a continuous basis by the hydrosphere (i.e., aquifer recharge rate).

MC_1. The net result is that the WMD is likely to perceive the marginal costs at the firm level as $(MC_1 + OC_1)$.

In fact, if OC is perceived as high enough, as represented by OC_2, then the supply curve would be S_4, given by $(MC_1 + OC_2)$. The permit would be denied and the farmer is allowed only W_4; that is, the farmer is not allowed to irrigate. The farmer observes this as a denial of the permit.

The interesting implication is that through negotiation the difference between W_1 and W_3 will be narrowed or widened, dependent upon how adept each group is at negotiation, or how much power and influence can be brought to bear, or to what extent the individuals that are a part of the process agree what the amount should be for any given setting. Thus, the complexity of the biological/physical/economic setting, values and attitudes, and power and influence, all become focused.

CHAPTER IV
DATA BASE, METHODOLOGY, AND EMPIRICAL MODELING

Data Base

The data base in the present study consisted of two parts: (1) primary data obtained from a mail survey conducted within the jurisdiction of the SWFWMD and (2) secondary data obtained from a computerized data base containing records of all CUPs issued in the SWFWMD.

All CUPs on record were first grouped by year and by consumptive use category, using the computer at the SWFWMD. A CUP was classified by the SWFWMD as AGR, IND, or PUB, or any combination of these three uses, and therefore could be placed in one, two, or three categories. Mutual exclusivity was not assured under the first grouping by year and use. The first list contained 6,153 CUPs (Table 2).

Each of these CUPs was evaluated on the basis of water use. In order to be placed in a water-use category, a CUP had to include at least 51 percent of its water use in that category. This approach assured mutual exclusivity and resulted in the deletion of approximately 5 percent of all CUPs in the data base. The new list thus contained 5,856 CUPs (Table 3).

Table 2. Initial CUP population, from 1976 to 1984, by agricultural (AGR), industrial (IND), and public-supply (PUB) consumptive use categories.

	Consumptive Use Permits									
Use Category	1976	1977	1978	1979	1980	1981	1982	1983	1984	Totals
AGR	13	125	118	653	336	631	490	1770	1130	5266
IND	2	6	4	11	11	25	31	44	51	185
PUB	1	17	16	64	102	101	78	152	171	702
Totals	16	148	138	728	449	757	599	1966	1352	6153

Table 3. Adjusted CUP population, from 1976 to 1984, by AGR, IND, and PUB consumptive use categories.

	Consumptive Use Permits									
Use Category	1976	1977	1978	1979	1980	1981	1982	1983	1984	Totals
AGR	13	124	116	647	330	620	477	1753	1108	5188
IND	2	6	4	7	11	23	31	40	49	173
PUB	0	11	9	33	59	60	64	111	148	495
Totals	15	141	129	687	400	703	572	1904	1305	5856

Based upon cost estimates for initial and follow-up mailings, coupled with expected return rates and the desire to obtain at least 30 responses per user group, the decision was to use approximately 10 percent of AGR, 40 percent of IND, and 15 percent of PUB CUPs. A table of 14,000 random digits [Selby, 1967] was used to select the sample of 434 CUPs from the adjusted population of 5,856 CUPs (Table 4). A discussion of stratified random sampling with proportional and non-proportional allocation is presented by Mendenhall et al. [1971]. Only those CUPs from 1982 to 1984 were selected, due to the difficulty respondents would have in recalling behavior, attitudes, and details of a process more than three years after the fact.

A list of 126 past and present governing board and CUP staff members was obtained from the SWFWMD. Due to the small number of potential respondents, all of these individuals were sent the survey instrument, even though many had served prior to the 1982-84 period of interest. Staff and board members who served before 1982 had played important roles in formulating District policy, both explicit and implicit.

Primary Data

The three survey instruments are shown in Appendices A, B, and C. The survey questionnaires were constructed using several survey concepts presented by Dillman [1978] and Babbie [1973], including instrument design and physical

Table 4. Non-proportional stratified random sample of CUPs, from 1982 to 1984, by AGR, IND, and PUB consumptive use categories.

Use Category	Percent of Stratum	Consumptive Use Permits			
		1982	1983	1984	Totals
AGR	10	48	176	111	335
IND	40	13	16	20	49
PUB	15	10	17	23	50
Totals		71	209	154	434

appearance, question order, spacing, operationalization, and the closed-ended nature of most questions. Operationalization is "the process whereby the researcher specifies empirical observations that may be taken as indicators of the attributes contained within a given concept" [Babbie, 1973, 134].

Respondents were presented with a series of menus or choices that were combinations of dichotomous, multiple-choice, and a few open-ended questions. Questionnaires most frequently use these three forms of questions [Mendenhall et al., 1971]. A Likert scale [Eckhardt and Ermann, 1977] was used in the design of the 27 parts of attitudinal question 1, which was exactly identical for all three respondent groups.

The survey instruments were first pre-tested on agents similar to those in the actual survey, although most were located in another WMD. These agents included several staff members, a public-supply user, and a governing board member. A number of agricultural users in the SWFWMD were also included in the pre-test.

A second mailing and telephone follow-up were planned in order to increase the return rate and accuracy of response, but were not used due to changes in the political sensitivity of water-related issues that developed after the response to the first wave of the mailing.[1]

Secondary Data

The computerized data base containing records of all CUPs issued in the SWFWMD from 1976 to the present is housed at the main offices of the SWFWMD in Brooksville, Florida. Essentially all input to and output from this data base is processed by a Univac mainframe computer.

Methodology and Empirical Modeling

Meeting Objectives

Meeting Objectives 1 and 2 involved an examination of statutory and administrative law, including Chapters 120 and 373, F.S., and Chapter 40D, F.A.C., as well as working rules, application forms, and procedures used day-to-day at the SWFWMD. Conversations with management and staff at the SWFWMD provided additional insights. Other qualitative attributes of the rules were incorporated where necessary.

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[1] Several members of the Governing Board of the Southwest Florida Water Management District raised concerns about the possibility that the questionnaire was biased, particularly against both past and present members of the board and district staff. There was a belief on their part that the questionnaire had been intentionally designed to make their activities somehow seem inappropriate. The resulting discussion and controversy was released to the press, and created a stir in the study area shortly after the first set of questionnaires had been returned. It was believed that responses received after the start of the debate would surely be biased, and therefore would not be useful in the present study, so these questionnaires were not used in the analysis. These matters are discussed in more detail in Appendix D, especially relating to the issue of bias, but also addressing ways to improve this type of questionnaire in the future.

Meeting Objective 3 involved the use of primary data to determine views held by players (applicants, WMD staff, and WMD governing board) related to cooperation in the CUP process. Cooperation was determined directly, by placing questions in the instrument that explicitly ask for such views. Cooperation was also determined indirectly, by placing questions on all three instruments that are identical and then measuring the differences between responses. Therefore, if the applicant responded with "Strongly Disagree" and the WMD responded with "Strongly Agree" on the same question or set of issues, then one might expect a non-cooperative scenario to develop.

Meeting Objective 4 involved the use of primary and secondary data. Player characteristics such as income and education were examined via explicitly stated questions. Other questions were used that attempted to examine values and goals, including views on environment, growth, water conservation, technology, water scarcity, the need to establish rights now, economic costs and benefits of permitting, power and influence, fairness, risk and uncertainty, hedonics, permitting as a game, sum of the permitting game, best strategies, cooperation, who actually decides, externalities, and intertemporal effects of water use.

Meeting Objective 5 involved the use of primary data. By first meeting Objective 1 and thereby establishing the rules of the game, the most salient features of the process could be determined. At that point, strategies to be considered by the applicant and regulator could be delineated. The division of the process into a pre-PAA phase and a post-PAA phase seemed to present the best way to formulate "game plans," on the part of both applicant and regulator. Likely decision pathways were constructed using this two-phase framework and respondents were asked to select the actions, real or potential, that would have been used or considered by them at each step in the process.

Meeting Objective 6 involved explicit questions on the applicant survey requesting information on the transactions costs involved. The payoff for the applicant was presented in the form of a payoff function, as discussed below in "Predictive Analysis and Payoff Functions." No attempt was made to quantify the payoff for the SWFWMD.

Descriptive Analysis

A descriptive analysis of player characteristics, player attitudes, and strategies was accomplished by using results from various statistical procedures (PROCs) in the Statistical Analysis System (SAS) [Helwig and Council, 1979], available at the Northeast Regional Data Center (NERDC) at the University of Florida campus.

Player characteristics

The following variables were included in the analysis: basin and county in which the CUP is located (BASIN and COUNTY); ownership code (OWNER); presence or absence of information (evidence) presented by others to protest the applicant's request for water (EVIDENT); number of groundwater and surface water withdrawal points (GRWDPTS and SURWDPTS); number of stipulations specified on the CUP (NRSTIP); age of the person responding to the questionnaire (AGERESP); age of the operation that has the CUP (AGEOPER); education and income (EDUC and INCOME); time in present occupation for board members (TIMEOCCU); and type of organization that has the CUP (ORGTYPE).

Player attitudes

The following variables were included in the analysis: the 27 parts of attitude question 1 (ATT_j and $CUPATT_j$); perceived competition for water (COMP); attitude toward technological change (TECHATT); importance and ranking of criteria to be used in the evaluation of CUP applications, as perceived by board and staff (TECHIMP through PERSIMP, and TECHRANK through PERSRANK); degree of difficulty in obtaining the water requested on an application, as perceived by board and staff (SAMEDIFF, and AGRRANK through PUBRANK); and WMD working relationships, as perceived by board and staff (WORKSTF, WORKBD, WORKOFFI, and SAMEVIEW).

Each of the 27 parts of survey question 1 was included to gain information concerning player attitudes on one or more of the eight aspects of a game. Within the framework of the eight aspects of a game, all of the 27 parts of question 1 are listed below.

Attitudes on the rules of the game were examined by parts 1, 2, 3, 4, 5, 7, 9, 11, 12, 18, 22, 23, 24, 25, and 27.

Attitudes on the nature of the game competition were examined by parts 15, 17, 18, and 24.

Attitudes on the players were examined by parts 2, 7, 8, 10, 11, 12, 13, 16, 19, 24, 25, 26, and 27.

Attitudes on the strategy space were examined by parts 15, 17, 18, and 20.

Attitudes on the payoff function were examined by parts 3, 6, 10, 14, 19, and 26.

Attitudes on the game sum were examined by parts 21 and 24.

Attitudes on the form of the game were not examined. This theoretical construct was discussed in Chapter III. The form assumed to be most useful, and employed herein, was the extensive, storytelling form that was compatible with the institutionalist approach. This form was implicit in the question order within the surveys; the temporal component of the analysis was inherently a part of the instruments.

Attitudes on the time period of the game were examined by parts 4, 6, 10, 14, and 26.

Strategies

The following variables were included in the analysis: classification used on the application (PRECL and POSTCL); contacts used by applicant (PRECON and POSTCON); waiver of the time limit imposed by the law (WAIVELIM); overestimation of water needed on the application (OVRESTIM); attendance at District meetings (MEETINGS); cost to applicant in terms of time, internal cash costs, and external cash costs (COSTTIME, COSTCASH, and COSTHELP); Proposed Agency Action (PAA); acceptance of PAA (ACCEPPAA); changes made by applicant (APPCHANG); changes made by District (WMDCHANG); further action taken by applicant (ACTION); percentage of contacts with applicants as perceived by board and staff members (PREPAA, POSTPAA, and PREFAA); and past, present, and future actions to be taken by applicant (TRANSFER, USEWATER, and RENEW).

Strategies were characterized in terms of those actions chosen by respondents, as specified on the survey instrument. It was assumed that most respondents were able to recall the details of the CUP application procedure, since the sample was limited to the 1982-1984 time period.

Predictive Analysis and Payoff Functions

Equations (3.2) and (3.3) presented the initial points to consider in evaluating the payoff function in this game. By assuming the game to be two-person, where player 1 was the CUP applicant and player 2 was the WMD, the n-tuple becomes

$$a = (a_1, a_2) \tag{4.1}$$

and the payoff vector becomes

$$\Pi = (\Pi_1(a), \Pi_2(a)) \tag{4.2}$$

The present analysis did not attempt to quantify the payoff $\Pi_2(a)$, which was the payoff to the WMD. Thus, the predictive task was reduced to a determination of $\Pi_1(a)$, which was the payoff to the applicant and the dependent variable in the statistical analysis. Three types of independent, explanatory variables were considered in formulating potential payoff functions: player characteristics, player attitudes, and strategies.

It was not possible to estimate the NSB due to a lack of information on water demand and supply curves (see Recommendations in Chapter VI). Thus, the payoff to the applicant (the dependent variable) was specified by PERAVWD, PERMAXWD, INDEXAV, or INDEXMAX. The payoff in absolute terms was simply the amount of water granted on a CUP, given by PERAVWD and PERMAXWD. The payoff in relative terms was the ratio of the amount of water granted on a CUP to the amount of water that was requested, or INDEXAV and INDEXMAX, where

$$\text{INDEXAV} = \text{PERAVWD}/\text{REQAVWD} \tag{4.3}$$

$$\text{INDEXMAX} = \text{PERMAXWD}/\text{REQMAXWD} \tag{4.4}$$

and

$$0.0 \leq \text{INDEXAV} \leq 1.0 \qquad (4.5)$$

$$0.0 \leq \text{INDEXMAX} \leq 1.0 \qquad (4.6)$$

Conditions (4.5) and (4.6) represent the assumption that the amount granted did not exceed the amount requested.

INDEXAV and INDEXMAX might also be indicators of the effectiveness of strategies chosen by a consumptive use category and of the distributive effects of the permit process. For example, if AGR received INDEXAV = 0.9 and IND received INDEXAV = 0.8, one might conclude that the strategies of AGR proved to be more effective than those of IND in gaining access to the water resource. If all users had a mean of INDEXAV = 0.85, then AGR was gaining relative to IND, which might indicate distributive effects of the permit process across consumptive use categories. It was assumed that the amount requested was approximately equal to the amount actually needed, i.e., that the applicants used accurate methods for estimating the water they actually needed and then placed this estimate on the application.

It could first be expected that the success of the applicant would be related to different characteristics of the firm and the actual player. The first group of variables important in explaining payoff is thus BEGWD, CLASS, DATEISSU, EDUC, EVIDENT, GRWDPTS, INCOME, NRSTIP, NRUSES, ORGTYPE, OWNER, RURAL,[2] SURFCODE, SURWDPTS, and WELLCODE. The expected relationship of each to payoff is indicated in Table 5. Unfortunately, each could not be tested individually in this study as the data base was too limited. Thus, some means was sought to compress the major variable types into a smaller data set for the regression analysis.

To the extent that there were differences in the above list of characteristics among the applicant groups, CLASS would tend to capture all these effects. It was thus expected that CLASS could be used in the regression analysis to represent all the influences and conserve degrees of freedom. In terms of sign on CLASS, it was expected to be positive, as agricultural users would likely be relatively more successful than other users, mainly because the 1972 legislation favored current users of water. Agriculture was by far the largest user in Florida, in an historical sense. Also, most would agree it is a beneficial use, thus lending more support for the expectation that agricultural applicants would be more likely to gain the water requested.

The second type of explanatory variable, player attitudes, was specified by MSDIFATT, which represents a measure

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[2] COUNTY is respecified as RURAL, a 0/1 shifter. RURAL takes the value of 0 if COUNTY is Hillsborough, Manatee, Pinellas, or Sarasota, and takes the value of 1 for all other counties in the District. This dichotomy is based upon the notion of counties that are either (1) urban, coastal, developed, or facing aquifer constraints, or (2) rural, inland, undeveloped, or not facing aquifer constraints.

Table 5. Expected signs of coefficients in predictive models.

Variable	Sign	Rationale
BEGWD	neg	as YYMM date decreased, age increased and knowledge/effort/negotiation increased
CLASS	pos	0/1 (non-AGR/AGR) shifter; AGR asked for less and received proportionally more
DATEISSU	neg	as YYMMDD increased, date moved from past to present, water management concerns increased, and relatively less was permitted
EDUC	pos	as education increased, ability to negotiate and efforts increased
EVIDENT	neg	0/1 shifter; indicated absence/presence of protests against CUP application
GRWDPTS	neg	as number of points (and scale) increased, permit was more restricted
INCOME	pos	as income increased, perception of benefits and costs improved, and effort to gain CUP increased
NRSTIP	neg	as stipulations placed on CUP by District increased, permit in general was more restricted
NRUSES	neg	as number of uses (and scope) increased, permit was more restricted
ORGTYPE	neg	easier access for private firm, more difficult for corporations and government agencies
OWNER	neg	0/1 shifter; easier if owner was same as applicant
RURAL	pos	0/1 (urban/rural) shifter; urban faced greater aquifer constraints and got less

Table 5. Continued.

Variable	Sign	Rationale
SURFCODE	neg	as size of withdrawal (and scale) increased, permit was more restricted
SURWDPTS	neg	as number of points (and scale) increased, permit was more restricted
WELLCODE	neg	as size of withdrawal (and scale) increased, permit was more restricted
MSDIFATT	neg	as variance between applicant and District attitudes, goals, perceptions, and values increased, expected difficulty of interaction and negotiation also increased, thus decreasing ultimate payoff
CONTACTS	pos	number and type of contacts used during process helped to influence the outcome in the applicant's favor
REQAVWD	pos	applicant received some percentage of what he requested, for average withdrawal
REQMAXWD	pos	applicant received some percentage of what he requested, for maximum withdrawal
STRAT3	pos?	see Footnote 12
TC	pos	increased expenditure on the application process increased the quantity permitted

Table 5. Continued.

Variable	Sign	Rationale
REQAVWD *CLASS	pos	AGR applicant more likely to get request, due to smaller scale
REQMAXWD *CLASS	pos	same as above
MSDIFATT *CLASS	---	no a priori expectations about sign
CONTACTS *CLASS	---	same as above
STRAT3 *CLASS	---	same as above
TC *CLASS	---	same as above
DATEISSU *CLASS	---	same as above
CONTACTS *MSDIFATT	pos	as disparity in attitudes increased, more contacts were made to resolve the differences
STRAT3 *MSDIFATT	pos	as disparity in attitudes increased, more strategies were pursued to offset the differences
TC *MSDIFATT	pos	as disparity in attitudes increased, more money was spent to overcome the differences

of the differences in attitudes (and thus the underlying values) between applicants and the District. It could be expected that as MSDIFATT gets larger that the applicant would be less likely to obtain what was requested. The following algorithm was used to determine MSDIFATT, which was an estimate of the variance between attitudinal values held by the WMD (ATT_j) and those of the CUP applicants ($CUPATT_j$).

$$WMDATT_j = (\sum_{1}^{K} ATT_{j,k})/N_{j,K} \qquad (4.7)$$

$$DIFATT_{j,u} = CUPATT_{j,u} - WMDATT_j \qquad (4.8)$$

$$SQDIF_{j,u} = (DIFATT_{j,u})^2 \qquad (4.9)$$

$$SSDIFATT_u = \sum_{1}^{J} SQDIF_{j,u} \qquad (4.10)$$

$$MSDIFATT_u = SSDIFATT_u/J_u \qquad (4.11)$$

where

j = jth attitude, from 1 to 27

J = number of responses by a given user

k = kth board or staff member

K = number of board or staff members who responded to a given attitude statement

u = uth consumptive user, from 1 to 434

$WMDATT_j$ were calculated first. These were the 27 mean values for ATT_1 through ATT_{27} across all WMD respondents. Next, the difference $DIFATT_{j,u}$ between $CUPATT_{j,u}$ and $WMDATT_j$ was calculated for the uth consumptive user, when the user provided a response to the $CUPATT_j$. The squares of each

$DIFATT_{j,u}$ were then calculated and termed $SQDIF_{j,u}$. Next, the sum of these squares, $SSDIFATT_u$, was found for each consumptive user. Finally, the mean of the sum of squares $MSDIFATT_u$ was found for each CUP; this was $(SSDIFATT_u/J_u)$ for the uth user, where J_u was the number of $DIFATT_u$ values that were calculated above.

The third and last type of explanatory variable, strategies, was specified by CONTACTS,[3] REQAVWD, REQMAXWD, STRAT3,[4] and TC.[5] More CONTACTS with staff and board, and with others that can help in filling out the permit, would likely lead to more success, and thus the hypothesized positive sign. Similarly, STRAT3 would likely increase the payoff, as it generally represents more activity by the applicant. More expenditures of time and money in TC should also lead to a larger success rate.

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[3] CONTACTS is the sum of PRECON and POSTCON and indicates the contacts used at any time during the entire application process.

[4] STRAT3 is the sum of MEETINGS, OVRESTIM, and WAIVELIM. STRAT3 indicates additional active participation in the application process, but the expected sign on the coefficient is unclear. Attendance at District meetings would enhance the applicant's understanding of the process and improve communication. Overestimation of quantities actually needed might be a good strategy to get enough in absolute terms, but it could also lower the payoff in relative (indexed) terms. Waiver of the time limits imposed by statute may be construed by the District as a measure of good faith and cooperativeness.

[5] TC is the sum of COSTCASH and COSTHELP and is a measure of the transactions costs involved in applying for a CUP.

Interaction terms were included as explanatory variables because of the hypothesis that the group to which an applicant belonged (CLASS) would have a significant effect on his attitudes and actions (MSDIFATT, CONTACTS, STRAT3, and TC). Similarly, it was hypothesized that attitudes (MSDIFATT) would influence actions (CONTACTS, STRAT3, and TC) and these interaction terms were also included as explanatory variables.

The remaining two variables of Table 5, REQAVWD and REQMAXWD, were included in two of the regression models under the presumption that if the success rate was high, then the permitted amounts PERAVWD and PERMAXWD would likely be very highly related to that requested. These, plus the relative request models, gives

PERAVWD = PERAVWD (CLASS, REQAVWD, MSDIFATT, CONTACTS, STRAT3, TC, DATEISSU, REQAVWD*CLASS, MSDIFATT*CLASS, CONTACTS*CLASS, STRAT3*CLASS, TC*CLASS, DATEISSU*CLASS, CONTACTS*MSDIFATT, STRAT3*MSDIFATT, TC*MSDIFATT) (4.12)

PERMAXWD = PERMAXWD (CLASS, REQMAXWD, MSDIFATT, CONTACTS, STRAT3, TC, DATEISSU, REQMAXWD*CLASS, MSDIFATT*CLASS, CONTACTS*CLASS, STRAT3*CLASS, TC*CLASS, DATEISSU*CLASS, CONTACTS*MSDIFATT, STRAT3*MSDIFATT, TC*MSDIFATT) (4.13)

INDEXAV = INDEXAV (CLASS, MSDIFATT, CONTACTS, STRAT3, TC, DATEISSU, MSDIFATT*CLASS, CONTACTS*CLASS, STRAT3*CLASS, TC*CLASS, DATEISSU*CLASS, CONTACTS*MSDIFATT, STRAT3*MSDIFATT, TC*MSDIFATT) (4.14)

```
INDEXMAX = INDEXMAX (CLASS, MSDIFATT,          (4.15)
           CONTACTS, STRAT3, TC, DATEISSU,
           MSDIFATT*CLASS, CONTACTS*CLASS,
           STRAT3*CLASS, TC*CLASS,
           DATEISSU*CLASS, CONTACTS*MSDIFATT,
           STRAT3*MSDIFATT, TC*MSDIFATT)
```

With the requested amount as an independent variable and the permitted amount as a dependent as in Equations (4.12) and (4.13), if the request variables are the only ones significant, then there is an extremely simple game operating. The main strategy is "simply to ask." If other variables are also statistically significant, then the game is more complex, involving more effort and more sophisticated strategies.

Equations (4.14) and (4.15) facilitate addressing a related issue, pertaining to the relative success. If none of the variables are significant, then the request so dominates the strategy space as to relegate the other strategies to not being very important, which should also be revealed in the first two models. That is, the ratio of permitted to requested will be so small and thus so similar among the groups, as to put no variation in the dependent variable. Without variation, there is nothing to be explained by the independent variables. Thus, the index models will provide further insight on what the important strategies really are in the current game.

PROC GLM was used to test the four predictive models and to test for differences between means of the dependent and independent variables included in the models, by CLASS.

PROC CORR was used to determine Pearson correlation coefficients for those same variables and to check for multicollinearity. PROC MEANS provided additional summary data analysis.

CHAPTER V
RESULTS

Qualitative Information

Institutions do change over time, and thus an institutional analysis becomes, of necessity, one of change or process. In order to comprehend the current status of the game being played, one must consider those changes in the rules, players, strategies, and payoffs (or objectives) that have occurred over recent years.

During the late 1960s, Americans were becoming more aware of environmental issues, especially those related to air and water. Qualitative, quantitative, spatial, and temporal attributes of water emerged as national issues. Earth Day was evidence of this changing awareness. As noted earlier, the severe droughts in Florida during the 1960s and again in 1971 [Hamann, 1984] very likely helped to spur the enactment of new Florida legislation to deal with water problems in the state. Maloney at the University of Florida's Holland Law Center was instrumental in drafting the foundations for the Florida Water Resources Act of 1972.

Between 1972 and 1975, little was done in terms of consumptive use permitting, although the enabling legislation had been included in the 1972 Act. By 1975 or 1976, the SWFWMD had begun to issue CUPs. During the 1972-1975 period, all was not quiet, however, in the SWFWMD. The "Water Wars" in the Tampa-St. Petersburg and surrounding areas [McCormack et al., 1984, 253] prompted the Florida legislature to provide enabling legislation for the West Coast Regional Water Supply Authority, which was created on October 25, 1974. Provision was also made at that time, and later on, for other regional water supply authorities and for assistance (ad valorem tax adjustments, for example) to the infant West Coast Regional Supply Authority.

Other WSAs were formed later, partly in response to the potential need perceived by regional interests to protect their present water rights. Such groups may have expected that the supply of water would become a binding constraint for growth and productivity, as well as a source of risk and uncertainty if steps were not taken to ensure its future availability. Examples include the formation of the Withlacoochee Regional Water Supply Authority on February 23, 1977, and the Peace River-Manasota Regional Water Supply Authority on February 26, 1982.

Water crop "is simply the amount of water that is annually available for man's use from a given area" and "has also been described as the water yield of an area" [Southwest Florida Water Management District, 1978, 4]. The use of the water crop concept for allocating water on an individual basis (i.e., on CUPs) was addressed by a Hearing Officer within the Florida Department of Administration, in

Pinellas County v. Southwest Florida Water Management District, Case No. 79-2325R, and in West Coast Regional Water Supply Authority v. Southwest Florida Water Management District, Case No. 79-2393R. As a result of these rule challenges,

> [the] Final Order entered on April 9, 1980, . . . declared the . . . existing Rule 16J-2.11(3), Florida Administrative Code, to be an invalid exercise of delegated legislative authority. That rule provided that the issuance of a consumptive use permit would be denied if the amount of water consumptively used would exceed the water crop of lands owned, leased or otherwise controlled by the applicant. [Division of Administrative Hearings, 1980, 2]

This criterion for allocation of the resource was no longer available for use by the District. A key component of the rules of the game had been deleted, thereby forcing the WMD to employ alternative measures in its decision process.

The constitutionality of the reasonable-beneficial use criterion in conjunction with the administrative-permit system was contested and upheld in 1979 by the Florida Supreme Court in Village of Tequesta v. Jupiter Inlet Corp. [Southern Reporter, 1979]. Also known as the "Tequesta decision," this case indicated that "standards and procedures of the Water Resources Act [had] thus replaced the common law as the means for resolving conflicts regarding the use of water" [Hamann, 1984, 248]. Eminent domain, taking, specification of rights to water beneath one's property, and compensation were among those issues addressed at that time [Southwest Florida Water Management District, 1980]. The rules of the game had definitely been changed by the 1972 legislation.

The period between 1979 and 1984 showed a marked increase in the number of CUPs issued in the SWFWMD across all consumptive use categories. More AGR, IND, and PUB players were participating in the game. This additional activity was due to gained acceptance of the CUP process among consumptive users, improvements in CUP administration within the WMD, greater need for permits in a growing population base, and an increase in information concerning CUPs through university extension agents and other information channels.

In 1983, an amendment to the Florida Administrative Procedures Act altered the decision-making process used by the WMD governing board. A finding of fact could be determined by a hearing officer, regarding the consumptive use of water by a potential user, and such finding of fact could be countered by the District only if the District could establish proof to the contrary. The applicant could now take the offensive and place the District on the defensive. This potentially constituted a reversal of the previously existing legal situation.

In October 1984, the SWFWMD rewrote some of its administrative rules that dealt with the CUP process, including deletion of evidentiary status, creation of an Individual/General category to complement the AGR/IND/PUB categories, and movement to a PAA/FAA system of notifying applicants of their status.

The above discussion describes the major changes in the game from the late 1960s to 1984, in terms of the rules, players, strategies, and payoffs. Adjustments have been made in the F.S. when the legislature responded to such phenomena as drought, population increase, interbasin or interjurisdictional conflicts over water, and lobby efforts by specific interest groups. Administrative rules have been reshaped, pursuant to the F.S., leading to the current form of Chapter 40D, F.A.C.

Participants in the game have changed in number and in character. Population has increased. Interest groups such as regional water supply authorities have formed. Relative weights of agricultural, industrial, and residential economic sectors have shifted. As the population of Florida increased from less than two million to over ten million in the last few decades, and with increased urban and recreation sectors, the complexion of Florida is not as it was prior to World War II.

As local, regional, and state objectives have been respecified over time, real or potential payoffs have changed in accordance with those goals. Modified tastes and preferences (that would create shifts in demand curves) and technology (that would create shifts in supply curves) would alter objectives, production functions, and payoffs, as well as the manner in which water would be viewed as a state resource.

Quantitative Data

Summary quantitative data obtained from primary and secondary sources, as described in Chapter IV, are presented in the sections that follow, first in a descriptive analysis and then in a predictive analysis.

Descriptive Analysis

The descriptive analysis includes survey response rates, player characteristics, player attitudes, and strategies.

Survey response rates

From the total of 434 questionnaires that were sent to the AGR, IND, and PUB permit applicants, 145 were returned, for a 33.4 percent combined response rate. There were 119 AGR returns, or a 35.5 percent response. Due to the low response (26 returns, or 26.3 percent) in the IND and PUB mailing categories, these two groups were combined to form a new category, non-agriculture (or non-AGR). From the total of 126 questionnaires that were sent to the WMD board and staff members, 38 were returned, for a 30.2 percent response. Due to the low response rate in the STAFF and BOARD mailing categories, the responses to many questions were combined to form a new category, WMD (Water Management District). The overall response was therefore 183 returns from the total mailing of 560, or 32.7 percent.

Player characteristics

Tables 6 through 16 present summary data on BASIN, COUNTY, OWNER, EVIDENT, GRWDPTS, SURWDPTS, NRSTIP, AGERESP, AGEOPER, EDUC, INCOME, TIMEOCCU, and ORGTYPE.

Tables 6 through 8 indicate BASIN and COUNTY. AGR respondents and non-respondents are more similar by basin than are non-AGR respondents and non-respondents. Over 75 percent of respondents are found in the Alafia, Peace, and Withlacoochee basins. This is not true of non-respondents. Low response rates on non-AGR may have influenced this result. AGR respondents and non-respondents are similar by county. Again, non-AGR respondents and non-respondents are dissimilar by county, perhaps due to the low response rate.

The ownership code in Table 9 is predominantly "Yes" in both AGR and non-AGR. As for evidentiary status in Table 10, AGR shows only about 2 percent "Yes," whereas non-AGR is at least 19 percent "Yes." AGR overall displays fewer GRWDPTS, SURWDPTS, and NRSTIP than does non-AGR overall, as shown in Table 11.

Tables 12 through 15 present summary data for age, education, income, and time in occupation (for WMD board). The typical AGR respondent is more than 10 years older than the typical non-AGR respondent. Age of operations for both AGR and non-AGR is indicated to be over 20 years, for more than half of all respondents. AGR permit applications were filled out 77 percent of the time by persons having 13 years

Table 6. Player characteristics: number of CUPs by river basin (BASIN).

	AGR Permits			
	Respondents		Non-respondents	
BASIN	Frequency	Percent	Frequency	Percent
District	7	5.9	14	6.5
Alafia	19	16.0	14	6.5
Hillsborough	9	7.6	18	8.3
N.W. Hills	3	2.5	5	2.3
Coastal Rivers	0	0.0	7	3.2
Pinellas-Anclote	1	0.8	7	3.2
Pithlachascotee	0	0.0	0	0.0
Withlacoochee	6	5.0	16	7.4
Peace	66	55.5	128	59.3
Manasota	8	6.7	7	3.2

	Non-AGR Permits			
	Respondents		Non-respondents	
BASIN	Frequency	Percent	Frequency	Percent
District	0	0.0	2	2.8
Alafia	4	15.4	4	5.6
Hillsborough	1	3.8	16	22.2
N.W. Hills	1	3.8	3	4.2
Coastal Rivers	2	7.7	13	18.1
Pinellas-Anclote	0	0.0	7	9.7
Pithlachascotee	0	0.0	1	1.4
Withlacoochee	4	15.4	11	15.3
Peace	13	50.0	14	19.4
Manasota	1	3.8	1	1.4

Table 7. Player characteristics: number of AGR CUPs by county (COUNTY).

	AGR Permits			
	Respondents		Non-respondents	
COUNTY	Frequency	Percent	Frequency	Percent
Charlotte	1	0.8	0	0.0
Citrus	1	0.8	4	1.9
Desoto	4	3.4	16	7.4
Hardee	12	10.1	32	14.8
Hernando	1	0.8	2	0.9
Highlands	1	0.8	9	4.2
Hillsborough	26	21.8	28	13.0
Lake	0	0.0	2	0.9
Levy	0	0.0	3	1.4
Manatee	7	5.9	5	2.3
Marion	0	0.0	1	0.5
Pasco	6	5.0	13	6.0
Pinellas	1	0.8	6	2.8
Polk	56	47.1	87	40.3
Sarasota	0	0.0	2	0.9
Sumter	3	2.5	6	2.8

Table 8. Player characteristics: number of non-AGR CUPs by county (COUNTY).

	Non-AGR Permits			
	Respondents		Non-respondents	
COUNTY	Frequency	Percent	Frequency	Percent
Charlotte	0	0.0	2	2.8
Citrus	1	3.8	3	4.2
Desoto	2	7.7	3	4.2
Hardee	0	0.0	0	0.0
Hernando	2	7.7	9	12.5
Highlands	0	0.0	0	0.0
Hillsborough	2	7.7	17	23.6
Lake	0	0.0	0	0.0
Levy	0	0.0	0	0.0
Manatee	1	3.8	0	0.0
Marion	0	0.0	2	2.8
Pasco	1	3.8	15	20.8
Pinellas	0	0.0	5	6.9
Polk	15	57.7	14	19.4
Sarasota	0	0.0	1	1.4
Sumter	2	7.7	1	1.4

Table 9. Player characteristics: number of CUPs by ownership code (OWNER).

	AGR Permits			
	Respondents		Non-respondents	
OWNER	Frequency	Percent	Frequency	Percent
Yes	116	97.5	209	96.8
No	3	2.5	7	3.2

	Non-AGR Permits			
	Respondents		Non-respondents	
OWNER	Frequency	Percent	Frequency	Percent
Yes	8	30.8	67	93.1
No	18	69.2	5	6.9

Table 10. Player characteristics: number of CUPs by evidentiary status (EVIDENT).

	AGR Permits			
	Respondents		Non-respondents	
EVIDENT	Frequency	Percent	Frequency	Percent
Yes	1	0.8	5	2.3
No	118	99.2	211	97.7
	Non-AGR Permits			
	Respondents		Non-respondents	
EVIDENT	Frequency	Percent	Frequency	Percent
Yes	8	30.8	14	19.4
No	18	69.2	58	80.6

Table 11. Player characteristics: groundwater withdrawal points (GRWDPTS), surface water withdrawal points (SURWDPTS), and number of stipulations (NRSTIP), with number of observations (N), mean, and standard deviation (S.D.).

	AGR Permits							
	Respondents			Non-respondents			Overall	
Variable	N	Mean	S.D.	N	Mean	S.D.	N	Mean
GRWDPTS[a]	119	1.71	2.27	216	1.39	1.26	335	1.50
SURWDPTS[b]	119	0.11	0.77	216	0.06	0.26	335	0.08
NRSTIP[c]	119	3.41	3.27	216	3.13	0.66	335	3.23
	Non-AGR Permits							
	Respondents			Non-respondents			Overall	
Variable	N	Mean	S.D.	N	Mean	S.D.	N	Mean
GRWDPTS	26	10.65	20.66	72	6.97	12.19	98	7.95
SURWDPTS	26	0.27	0.83	72	0.19	0.83	98	0.21
NRSTIP	26	57.85	193.34	72	20.97	54.70	98	30.76

[a] For GRWDPTS, mean in non-AGR overall is greater than AGR overall at $\alpha = .0001$ level.

[b] For SURWDPTS, mean in non-AGR overall is greater than AGR overall at $\alpha = .0501$ level.

[c] For NRSTIP, mean in non-AGR overall is greater than AGR overall at $\alpha = .0001$ level.

Table 12. Player characteristics: age of respondents (AGERESP), in years, with number of observations (N), mean, and standard deviation (S.D.); age of operation (AGEOPER).

AGERESP	N	Mean	S.D.
AGR permits	113	55.35	14.79
Non-AGR permits	21	44.95	9.93
District board	9	57.78	7.41
District staff	26	37.54	12.45

	AGR Permits		Non-AGR Permits	
AGEOPER	Frequency	Percent	Frequency	Percent
Less than 10 years	16	13.7	3	12.0
11 to 20 years	23	19.7	8	32.0
21 to 30 years	28	23.9	2	8.0
More than 30 years	50	42.7	12	48.0

Table 13. Player characteristics: education completed by person who filled out CUP application (EDUC); education of District board and staff (EDUC).

	AGR Permits		Non-AGR Permits	
EDUC	Frequency	Percent	Frequency	Percent
Less than 9 years	1	0.9	0	0.0
9 to 12 years	25	21.7	4	16.7
13 to 16 years	53	46.1	13	54.2
More than 16 years	36	31.3	7	29.2

	District Board		District Staff	
EDUC	Frequency	Percent	Frequency	Percent
Less than 9 years	0	0.0	0	0.0
9 to 12 years	1	10.0	1	3.7
13 to 16 years	6	60.0	11	40.7
More than 16 years	3	30.0	15	55.6

Table 14. Player characteristics: income of AGR and non-AGR respondents (INCOME).

	AGR Permits		Non-AGR Permits	
INCOME	Frequency	Percent	Frequency	Percent
Less than $20,000	25	25.5	1	4.3
$20,001 to $40,000	17	17.3	0	0.0
$40,001 to $60,000	10	10.2	0	0.0
$60,001 to $80,000	6	6.1	3	13.0
$80,001 to $100,000	4	4.1	0	0.0
$100,001 to $150,000	5	5.1	0	0.0
$150,001 to $200,000	1	1.0	1	4.3
$200,001 to $500,000	11	11.2	1	4.3
$500,001 to $1,000,000	5	5.1	0	0.0
More than $1,000,000	14	14.3	17	73.9

Table 15. Player characteristics: time in primary occupation (TIMEOCCU) and income (INCOME) for District board.

TIMEOCCU	Frequency	Percent
Less than 1 year	0	0.0
1 to 5 years	1	10.0
6 to 10 years	0	0.0
11 to 15 years	0	0.0
More than 15 years	9	90.0
INCOME	Frequency	Percent
Less than $10,000	0	0.0
$10,001 to $20,000	0	0.0
$20,001 to $30,000	0	0.0
$30,001 to $40,000	4	44.4
$40,001 to $50,000	0	0.0
More than $50,000	5	55.6

Table 16. Player characteristics: description of organization that has the CUP (ORGTYPE).

	AGR Permits		Non-AGR Permits	
ORGTYPE	Frequency	Percent	Frequency	Percent
Private business	70	59.8	1	4.0
Joint business	44	37.6	18	72.0
Government unit	3	2.6	6	24.0

or more of education. Similarly, 83 percent of non-AGR applications were filled out by persons with 13 years or more of education. About 95 percent of District staff and 90 percent of District board members possessed more than 13 years of education.

Income levels were generally higher for non-AGR respondents, but this is attributable to the different ORGTYPE distributions seen in AGR and non-AGR respondents. Due to the low response rates, it is difficult to draw any conclusions concerning TIMEOCCU and INCOME for District board members.

ORGTYPE distributions, shown in Table 16, are indicative of (1) the private family farm and partnership/corporate farm in AGR and (2) the corporations in IND and governmental units in PUB that comprise non-AGR.

Player attitudes

Tables 17 through 51 present summary data on ATT_j, $CUPATT_j$, COMP, TECHATT, TECHIMP through PERSIMP, TECHRANK through PERSRANK, SAMEDIFF, AGRRANK through PUBRANK, WORKSTF, WORKBD, WORKOFFI, and SAMEVIEW.

The 27 parts of question 1 are each presented in terms of frequency and percent in Tables 17 through 43. The number of observations, mean, standard deviation, and results of the Duncan's multiple range test are also presented for all 27 parts in Table 44.

Table 17. Player attitudes: responses to survey question 1, part 1, "The CUP system is not needed."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	9	7.8	1	3.8	0	0.0
Agree	12	10.4	3	11.5	1	2.6
Undecided	12	10.4	2	7.7	0	0.0
Disagree	62	53.9	12	46.2	6	15.8
Strongly disagree	20	17.4	8	30.8	31	81.6

Table 18. Player attitudes: responses to survey question 1, part 2, "The Water District acts more as a useless 'bureaucracy' than as an agency to serve the people."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	1	0.9	4	15.4	1	2.6
Agree	11	9.6	2	7.7	2	5.3
Undecided	22	19.3	1	3.8	2	5.3
Disagree	58	50.9	15	57.7	16	42.1
Strongly disagree	22	19.3	4	15.4	17	44.7

Table 19. Player attitudes: responses to survey question 1, part 3, "Rapid population growth is good, and water should be used to help such growth."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	3	2.7	1	3.8	3	8.1
Agree	23	20.4	4	15.4	6	16.2
Undecided	10	8.8	1	3.8	0	0.0
Disagree	37	32.7	15	57.7	19	51.4
Strongly disagree	40	35.4	5	19.2	9	24.3

Table 20. Player attitudes: responses to survey question 1, part 4, "Water will be scarce in parts of Florida before the end of this century."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	51	43.6	8	30.8	12	31.6
Agree	53	45.3	10	38.5	16	42.1
Undecided	5	4.3	1	3.8	2	5.3
Disagree	8	6.8	6	23.1	6	15.8
Strongly disagree	0	0.0	1	3.8	2	5.3

Table 21. Player attitudes: responses to survey question 1, part 5, "The latest water conserving technology should be required of all applicants, even if profits are lower."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	16	13.9	5	20.0	9	23.7
Agree	38	33.0	8	32.0	21	55.3
Undecided	43	37.4	7	28.0	3	7.9
Disagree	13	11.3	3	12.0	4	10.5
Strongly disagree	5	4.3	2	8.0	1	2.6

Table 22. Player attitudes: responses to survey question 1, part 6, "The future financial/economic benefits of a water permit are great enough to justify spending time and money to get a CUP today."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	13	11.2	4	15.4	9	23.7
Agree	67	57.8	17	65.4	16	42.1
Undecided	21	18.1	4	15.4	8	21.1
Disagree	13	11.2	1	3.8	5	13.2
Strongly disagree	2	1.7	0	0.0	0	0.0

Table 23. Player attitudes: responses to survey question 1, part 7, "If you have more power, influence in the community, or higher social status, it is easier to get a CUP."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	9	7.9	1	3.8	1	2.6
Agree	14	12.3	2	7.7	8	21.1
Undecided	43	37.7	15	57.1	8	21.1
Disagree	39	34.2	6	23.1	12	31.6
Strongly disagree	9	7.9	2	7.7	9	23.7

Table 24. Player attitudes: responses to survey question 1, part 8, "Water supply authorities, which represent groups of towns, cities, or counties, get CUPs more easily than individual applicants."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	16	13.9	1	4.0	5	13.2
Agree	24	20.9	9	36.0	6	15.8
Undecided	51	44.3	8	32.0	6	15.8
Disagree	23	20.0	7	28.0	16	42.1
Strongly disagree	1	0.9	0	0.0	5	13.2

Table 25. Player attitudes: responses to survey question 1, part 9, "The procedures used in applying for a CUP are clear and logical."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	4	3.5	0	0.0	1	2.7
Agree	73	63.5	12	46.2	21	56.8
Undecided	9	7.8	7	26.9	7	18.9
Disagree	23	20.0	6	23.1	8	21.6
Strongly disagree	6	5.2	1	3.8	0	0.0

Table 26. Player attitudes: responses to survey question 1, part 10, "Getting a CUP now is important because of future competition for available water."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	23	20.0	2	8.0	3	8.1
Agree	71	61.7	16	64.0	19	51.4
Undecided	11	9.6	0	0.0	7	18.9
Disagree	10	8.7	7	28.0	6	16.2
Strongly disagree	0	0.0	0	0.0	2	5.4

Table 27. Player attitudes: responses to survey question 1, part 11, "The District staff is fair in its recommendations to the Governing Board, as to who should get a CUP."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	5	4.4	1	3.8	5	13.2
Agree	70	61.4	13	50.0	26	68.4
Undecided	37	32.5	11	42.3	3	7.9
Disagree	2	1.8	1	3.8	3	7.9
Strongly disagree	0	0.0	0	0.0	1	2.6

Table 28. Player attitudes: responses to survey question 1, part 12, "The District Governing Board is fair in assigning CUPs."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	7	6.1	1	3.8	6	15.8
Agree	71	62.3	11	42.3	21	55.3
Undecided	33	28.9	11	42.3	8	21.1
Disagree	3	2.6	1	3.8	3	7.9
Strongly disagree	0	0.0	2	7.7	0	0.0

Table 29. Player attitudes: responses to survey question 1, part 13, "An applicant with higher income can get a CUP more easily than someone with lower income."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	2	1.7	0	0.0	1	2.7
Agree	10	8.7	1	4.0	3	8.1
Undecided	43	37.4	10	40.0	3	8.1
Disagree	47	40.9	13	52.0	19	51.4
Strongly disagree	13	11.3	1	4.0	11	29.7

Table 30. Player attitudes: responses to survey question 1, part 14, "Getting a CUP is the same as staking a claim in the future economic activity of Florida."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	7	6.3	0	0.0	0	0.0
Agree	55	49.1	10	41.7	11	28.9
Undecided	33	29.5	9	37.5	9	23.7
Disagree	16	14.3	3	12.5	14	36.8
Strongly disagree	1	0.9	2	8.3	4	10.5

Table 31. Player attitudes: responses to survey question 1, part 15, "Requesting only the amount of water actually needed is the best strategy for getting a CUP."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	6	5.2	2	7.7	4	10.5
Agree	73	63.5	8	30.8	25	65.8
Undecided	16	13.9	4	15.4	5	13.2
Disagree	18	15.7	11	42.3	3	7.9
Strongly disagree	2	1.7	1	3.8	1	2.6

Table 32. Player attitudes: responses to survey question 1, part 16, "Large corporations or businesses are more likely to get CUPs than individuals or small businesses."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	3	2.6	0	0.0	1	2.6
Agree	27	23.7	2	8.0	2	5.3
Undecided	27	23.7	10	40.0	5	13.2
Disagree	51	44.7	11	44.0	20	52.6
Strongly disagree	6	5.3	2	8.0	10	26.3

Table 33. Player attitudes: responses to survey question 1, part 17, "The best strategy for getting a CUP is simply to use legal force, even if it leads to confrontation and conflict between the applicant and District staff or Governing Board."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	3	2.6	0	0.0	0	0.0
Agree	2	1.8	2	7.7	3	7.9
Undecided	23	20.2	6	23.1	3	7.9
Disagree	70	61.4	15	57.7	17	44.7
Strongly disagree	16	14.0	3	11.5	15	39.5

Table 34. Player attitudes: responses to survey question 1, part 18, "When the 'system' doesn't work, an individual can help by informing administrators, legislators and others in positions of authority so the system can be improved."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	15	13.2	1	4.0	4	10.8
Agree	82	71.9	11	44.0	23	62.2
Undecided	9	7.9	6	24.0	3	8.1
Disagree	7	6.1	7	28.0	6	16.2
Strongly disagree	1	0.9	0	0.0	1	2.7

Table 35. Player attitudes: responses to survey question 1, part 19, "CUPs should be given to people who gain the most individual pleasure and satisfaction from the water use."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	2	1.7	0	0.0	0	0.0
Agree	1	0.9	0	0.0	0	0.0
Undecided	6	5.2	0	0.0	1	2.7
Disagree	60	51.7	19	76.0	21	56.8
Strongly disagree	47	40.5	6	24.0	15	40.5

Table 36. Player attitudes: responses to survey question 1, part 20, "Success in getting a CUP is due more to strategy and approach than it is to luck and chance."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	4	3.5	1	4.0	3	8.1
Agree	70	61.4	16	64.0	23	62.2
Undecided	18	15.8	3	12.0	4	10.8
Disagree	21	18.4	4	16.0	2	5.4
Strongly disagree	1	0.9	1	4.0	5	13.5

Table 37. Player attitudes: responses to survey question 1, part 21, "With the water permit system, the water that one user gains is water that must be given up by another user."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	1	0.9	1	3.8	0	0.0
Agree	7	6.1	1	3.8	2	5.3
Undecided	19	16.7	2	7.7	3	7.9
Disagree	76	66.7	21	80.8	29	76.3
Strongly disagree	11	9.6	1	3.8	4	10.5

Table 38. Player attitudes: responses to survey question 1, part 22, "In the past, getting a CUP has been mostly an automatic 'rubber-stamp' process."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	0	0.0	0	0.0	4	10.8
Agree	32	28.1	7	26.9	7	18.9
Undecided	20	17.5	5	19.2	6	16.2
Disagree	56	49.1	13	50.0	18	48.6
Strongly disagree	6	5.3	1	3.8	2	5.4

Table 39. Player attitudes: responses to survey question 1, part 23, "When applying for a CUP, there is inadequate information about what to expect and the best way to fill out forms."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	5	4.4	0	0.0	0	0.0
Agree	35	30.7	10	38.5	13	34.2
Undecided	8	7.0	4	15.4	5	13.2
Disagree	62	54.4	11	42.3	19	50.0
Strongly disagree	4	3.5	1	3.8	1	2.6

Table 40. Player attitudes: responses to survey question 1, part 24, "A CUP application that would result in damage to a neighbor's wells should not be approved."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	13	11.2	2	8.0	3	8.1
Agree	56	48.3	16	64.0	23	62.2
Undecided	34	29.3	5	20.0	4	10.8
Disagree	13	11.2	2	8.0	6	16.2
Strongly disagree	0	0.0	0	0.0	1	2.7

Table 41. Player attitudes: responses to survey question 1, part 25, "The District staff really decides who gets a CUP, and not the Governing Board."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	5	4.5	0	0.0	0	0.0
Agree	25	22.7	4	16.0	11	28.9
Undecided	65	59.1	11	44.0	6	15.8
Disagree	13	11.8	8	32.0	18	47.4
Strongly disagree	2	1.8	2	8.0	3	7.9

Table 42. Player attitudes: responses to survey question 1, part 26, "Water users have a responsibility toward future generations to avoid damaging the groundwater system."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	64	54.7	9	34.6	27	71.1
Agree	50	42.7	17	65.4	10	26.3
Undecided	2	1.7	0	0.0	1	2.6
Disagree	1	0.9	0	0.0	0	0.0
Strongly disagree	0	0.0	0	0.0	0	0.0

Table 43. Player attitudes: responses to survey question 1, part 27, "The Governing Board is OFTEN required to evaluate problems that the District staff cannot see or analyze in CUP applications."

	AGR Permits		Non-AGR Permits		Board and Staff	
Response	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	4	3.5	0	0.0	2	5.3
Agree	30	26.5	6	25.0	18	47.4
Undecided	67	59.3	6	25.0	8	21.1
Disagree	10	8.8	8	33.3	8	21.1
Strongly disagree	2	1.8	4	16.7	2	5.3

Table 44. Player attitudes: overview of survey question 1, parts 1-27, with number of observations (N), mean, standard deviation (S.D.), and Duncan grouping (DG) from Duncan's multiple range test.

	AGR				Non-AGR				Board and Staff			
Part	N	Mean	S.D.	DG[a]	N	Mean	S.D.	DG	N	Mean	S.D.	DG
1	115	3.63	1.13	B	26	3.88	1.11	B	38	4.76	0.59	A
2	114	3.78	0.90	AB	26	3.50	1.30	B	38	4.21	0.96	A
3	113	3.78	1.21	A	26	3.73	1.08	A	37	3.68	1.25	A
4	117	1.74	0.83	B	26	2.31	1.26	A	38	2.21	1.21	A
5	115	2.59	1.01	A	25	2.56	1.19	A	38	2.13	0.99	A
6	116	2.34	0.89	A	26	2.08	0.69	A	38	2.24	0.97	A
7	114	3.22	1.03	A	26	3.23	0.86	A	38	3.53	1.16	A
8	115	2.73	0.97	B	25	2.84	0.90	AB	38	3.26	1.27	A
9	115	2.60	1.02	A	26	2.85	0.92	A	37	2.59	0.86	A
10	115	2.07	0.80	B	25	2.48	1.00	A	37	2.59	1.04	A
11	114	2.32	0.58	A	26	2.46	0.65	A	38	2.18	0.87	A
12	114	2.28	0.62	B	26	2.69	0.93	A	38	2.21	0.81	B
13	115	3.51	0.87	B	25	3.56	0.65	B	37	3.97	0.99	A
14	112	2.54	0.85	B	24	2.88	0.95	B	38	3.29	1.01	A
15	115	2.45	0.88	B	26	3.04	1.11	A	38	2.26	0.86	B
16	114	3.26	0.97	B	25	3.52	0.77	B	38	3.95	0.93	A
17	114	3.82	0.79	AB	26	3.73	0.78	B	38	4.16	0.89	A
18	114	2.10	0.73	B	25	2.76	0.93	A	37	2.38	0.98	B
19	116	4.28	0.76	A	25	4.24	0.44	A	37	4.38	0.55	A
20	114	2.52	0.86	A	25	2.52	0.96	A	37	2.54	1.17	A
21	114	3.78	0.74	A	26	3.77	0.76	A	38	3.92	0.63	A
22	114	3.32	0.94	A	26	3.31	0.93	A	37	3.19	1.15	A
23	114	3.22	1.06	A	26	3.12	0.99	A	38	3.21	0.96	A
24	116	2.41	0.83	A	25	2.28	0.74	A	37	2.43	0.96	A
25	110	2.84	0.76	B	25	3.32	0.85	A	38	3.34	0.99	A
26	117	1.49	0.58	AB	26	1.65	0.49	A	38	1.32	0.53	B
27	113	2.79	0.73	B	24	3.42	1.06	A	38	2.74	1.03	B

[a] Duncan's multiple range test controls the Type I comparisonwise error rate, not the experimentwise error rate. $\alpha = 0.05$, and means with the same letter in the Duncan grouping are not significantly different.

Table 45. Player attitudes: perceived competition for water (COMP), under the existing system of water management.

	AGR Permits		Non-AGR Permits	
COMP	Frequency	Percent	Frequency	Percent
Did not think there was any competition	43	36.8	16	64.0
Public-supply users	42	35.9	7	28.0
Agricultural users	36	30.8	8	32.0
Non-agriculture industrial users	16	13.7	7	28.0
Recreation/tourism	24	20.5	2	8.0
Wildlife, natural systems	16	13.7	1	4.0
Regional water supply authorities	14	12.0	5	20.0
The Water Management District	9	7.7	5	20.0
Other	1	0.9	0	0.0
Did not know	6	5.1	0	0.0

Table 46. Player attitudes: TECHATT.

	AGR Permits		Non-AGR Permits		Board and Staff	
TECHATT	Frequency	Percent	Frequency	Percent	Frequency	Percent
Private cost	22	16.2	3	8.1	9	16.4
Social cost	12	8.8	3	8.1	10	18.2
District prefers	3	2.2	2	5.4	1	1.8
Researchers prefer	10	7.4	2	5.4	3	5.5
Similar users prefer	30	22.1	9	24.3	9	16.4
Conserves water	55	40.4	12	32.4	20	36.4
Other	4	2.9	6	16.2	3	5.5

Table 47. Player attitudes: importance of criteria to be used in evaluation of CUP applications, as perceived by District board and staff.

	Technical Criterion		Economic Criterion	
Importance	Frequency	Percent	Frequency	Percent
Very	33	94.3	11	30.6
Somewhat	1	2.9	17	47.2
Not much	0	0.0	5	13.9
Not at all	1	2.9	3	8.3

	Distributive Criterion		Experience Criterion	
Importance	Frequency	Percent	Frequency	Percent
Very	0	0.0	9	25.7
Somewhat	4	11.8	13	37.1
Not much	10	29.4	7	20.0
Not at all	20	58.8	6	17.1

Table 48. Player attitudes: ranking of criteria to be used in evaluation of CUP applications, as perceived by District board and staff.

	Ranking Responses						
Criterion	#1	#2	#3	#4	N	Mean Score	Overall Rank
Technical	35	1	0	0	36	1.03	#1
Economic	1	16	15	3	35	2.57	#2
Distributive	0	4	7	25	36	3.58	#4
Experience	0	13	16	7	36	2.83	#3

Table 49. Player attitudes: degree of difficulty in obtaining the amount of water requested on the original CUP application, as perceived by District board and staff.

	Ranking Responses[a]					
Use Category	#1	#2	#3	N	Mean Score	Overall Rank
All three are the same	--	--	--	10		
Agriculture	15	5	4	24	1.54	#1
Industrial	4	8	12	24	2.33	#3
Public-supply	5	12	7	24	2.08	#2

[a] Note that #1=least difficulty, #2=second in difficulty, and #3=most difficulty.

Table 50. Player attitudes: working relationships, as perceived by the District board for WORKSTF, WORKOFFI, and SAMEVIEW.

	WORKSTF		WORKOFFI	
Response	Frequency	Percent	Frequency	Percent
Excellent	1	10.0	3	33.3
Strong	6	60.0	3	33.3
OK	2	20.0	2	22.2
Fair	0	0.0	0	0.0
Poor	1	10.0	1	11.1
None of the above	0	0.0	0	0.0

	SAMEVIEW	
Response	Frequency	Percent
Very close agreement	1	10.0
Moderately close agreement	6	60.0
Fairly close agreement	2	20.0
Little agreement	1	10.0
No agreement	0	0.0

Table 51. Player attitudes: working relationships, as perceived by the District staff for WORKBD, WORKSTF, and SAMEVIEW.

	WORKBD		WORKSTF	
Response	Frequency	Percent	Frequency	Percent
Excellent	4	14.8	10	37.0
Strong	4	14.8	11	40.7
OK	4	14.8	4	14.8
Fair	2	7.4	1	3.7
Poor	3	11.1	1	3.7
None of the above	10	37.0	0	0.0

	SAMEVIEW	
Response	Frequency	Percent
Very close agreement	8	29.6
Moderately close agreement	16	59.3
Fairly close agreement	3	11.1
Little agreement	0	0.0
No agreement	0	0.0

Attitudinal question 1 may be analyzed in at least two ways, using Table 44. The first way is to group responses by agreement, uncertainty, and disagreement. Therefore, if one views responses below 3.0 as indicative of agreement with the statement being made, responses at 3.0 as the mid-point or uncertainty about the statement being made, and responses above 3.0 as disagreement with the statement being made, then only five parts (8, 14, 15, 25, and 27) display any differences in agree/disagree responses. That is, for 22 of the 27 parts of attitude question 1, the AGR, non-AGR, and District respondents had similar viewpoints or attitudes. This would be in accordance with the belief that it is more realistic to attempt to discern between points on opposite sides of center (such as 2.7 and 3.3) than between points on the same side of center (such as 1.4 and 2.3).

A second way to view the attitudinal data is by using a multiple range test. The results of the Duncan's multiple range test, which were generated by PROC GLM, are shown in Table 44. Note that the Duncan's grouping pertains to only one part at a time. Thus, in part 1, the District board and staff mean of 4.76 is different from the AGR and non-AGR means of 3.63 and 3.88, respectively, but AGR and non-AGR means are not different. In part 2, the District mean of 4.21 is not different from the AGR mean of 3.78, but is different from the non-AGR mean of 3.50; the AGR and non-AGR means of 3.78 and 3.50 are not different. This analysis, when continued for all 27 parts, indicates that differences exist for parts 1, 2, 4, 8, 10, 12, 13, 14, 15, 16, 17, 18, 25, 26, and 27. This would be in accordance with the belief that one may realistically discern between any differences in attitude, even those attitudes found on the same side of the central (uncertainty) point.

Perceived competition for water (COMP) is summarized in Table 45. Note that since respondents were asked to circle all answers that applied, the sum of percentages is greater than 100. Almost 37 percent of AGR respondents felt there was no competition for water; the next two most common responses by AGR indicated that competition consisted of PUB users or other AGR users. The most frequent response by non-AGR also indicated an absence of competition for water; the three next most frequent choices by non-AGR were PUB, AGR, and non-AGR IND.

Respondents were asked to indicate the first and second most important reasons (REASON 1 and REASON 2) for changing technologies for water acquisition and/or use. The frequencies of these responses were combined as TECHATT and presented in Table 46. Conservation of water and preferences shown by similar users were the most important considerations for both AGR and non-AGR respondents. As stewards of the resource, the District board and staff indicated a concern for water conservation also, but saw social cost (i.e., the cost of using water as seen from society's point of view) as the next most important consideration.

From the District's point of view, technical and distributive criteria for evaluating a CUP application were at opposite ends of the importance scale, with the technical criterion being very important and the distributive criterion being important either "not much" or "not at all" (Table 47). Economic and personal experience criteria for evaluating an application seemed to be second and third in importance. These separate views were supported by the ranking of the four criteria provided in Table 48.

District board and staff respondents felt that AGR had the least difficulty and that IND had the most difficulty in obtaining the amount of water requested on the original application (Table 49).

From the board's point of view, in Table 50, working relationships with the staff and other officials were "OK" to "Excellent" (90 percent and 88 percent of totals, respectively). Additionally, 70 percent of the board members felt that they were in very close or moderately close agreement with other board members on permit/policy related matters (SAMEVIEW).

Table 51 shows that approximately 45 percent of all staff members indicated "OK" to "Excellent" working relationships with the board and 37 percent saw little need for contact with the board. This group of staff members may have had job descriptions that, by definition, called for rare contacts with the board. More than 90 percent of staff respondents thought that relations with other staff members were "OK" to "Excellent" and 80 percent of the staff said that they were in very close or moderately close agreement with fellow staff on CUP related matters (SAMEVIEW).

Strategies

Strategies are shown in Tables 52 through 61 and include the following variables: PRECL, POSTCL, PRECON, POSTCON, WAIVELIM, OVRESTIM, MEETINGS, COSTTIME, COSTCASH, COSTHELP, PAA, ACCEPPAA, APPCHANG, WMDCHANG, ACTION, PREPAA, POSTPAA, PREFAA, TRANSFER, USEWATER, and RENEW.

Table 52 shows that respondents predominantly used the appropriate consumptive use category to identify themselves on the application; that is, AGR used AGR, and non-AGR used IND or PUB as expected. It was thought that some applicants might specify a particular use category to obtain higher status or additional consideration, but this does not seem to be a selected strategy. Such a strategy may have been used when the permit process began in the mid-1970s, but applicants apparently are now aware that consumptive use category is explicitly determined by the WMD.

A District staff member was the most commmon contact used by both AGR and non-AGR applicants (Table 53). The second most common response for both groups was that they did not contact anyone. It appears that data concerning

Table 52. Strategies: PRECL and POSTCL.

	AGR Permits			Non-AGR Permits		
PRECL	N	Frequency	Percent	N	Frequency	Percent
Agricultural	117	114	97.4	21	3	14.3
Industrial	117	4	3.4	21	11	52.4
Public-supply	117	1	0.9	21	7	33.3
Other	117	1	0.9	21	2	9.5

	AGR Permits			Non-AGR Permits		
POSTCL	N	Frequency	Percent	N	Frequency	Percent
Agricultural	111	4	3.6	20	0	0.0
Industrial	111	1	0.9	20	4	20.0
Public-supply	111	0	0.0	20	0	0.0
Other	111	0	0.0	20	0	0.0

Table 53. Strategies: PRECON and POSTCON.

	AGR Permits			Non-AGR Permits		
PRECON	N	Frequency	Percent	N	Frequency	Percent
Did not contact anyone	115	32	27.8	20	5	25.0
A similar user	115	8	7.0	20	0	0.0
Family	115	6	5.2	20	0	0.0
Extension agent	115	14	12.2	20	0	0.0
District staff member	115	67	58.3	20	13	65.0
Other	115	11	9.6	20	2	10.0

	AGR Permits			Non-AGR Permits		
POSTCON	N	Frequency	Percent	N	Frequency	Percent
Did not contact anyone	110	1	0.9	20	0	0.0
A similar user	110	0	0.0	20	0	0.0
Family	110	0	0.0	20	0	0.0
Extension agent	110	0	0.0	20	0	0.0
District staff member	110	2	1.8	20	4	20.0
Other	110	1	0.9	20	1	5.0

Table 54. Strategies: WAIVELIM, OVRESTIM, and MEETINGS.

	AGR Permits			Non-AGR Permits		
Strategy	N	Frequency	Percent	N	Frequency	Percent
WAIVELIM	98	30	30.6	20	5	25.0
OVRESTIM	113	19	16.8	20	2	10.0
MEETINGS	111	2	1.8	20	3	15.0

Table 55. Strategies: COSTTIME.

	AGR Permits		Non-AGR Permits	
COSTTIME[a]	Frequency	Percent	Frequency	Percent
1 day or less	66	56.9	4	17.4
2 to 7 days	44	37.9	9	39.1
8 to 14 days	4	3.4	9	39.1
More than 14 days	2	1.7	1	4.3

[a] For COSTTIME, mean in non-AGR is greater than AGR at $\alpha = .0001$ level.

Table 56. Strategies: COSTCASH.

	AGR Permits		Non-AGR Permits	
COSTCASH[a]	Frequency	Percent	Frequency	Percent
$100 or less	89	76.1	6	28.6
$101 to $500	15	12.8	2	9.5
$501 to $1000	9	7.7	3	14.3
$1001 to $2000	3	2.6	9	42.9
More than $2000	1	0.9	1	4.8

[a] For COSTCASH, mean in non-AGR is greater than AGR at $\alpha = .0001$ level.

Table 57. Strategies: COSTHELP.

	AGR Permits		Non-AGR Permits	
COSTHELP[a]	Frequency	Percent	Frequency	Percent
$0	91	91.9	14	73.7
$1 to $200	3	3.0	1	5.3
$201 to $500	3	3.0	2	10.5
$501 to $1000	0	0.0	1	5.3
$1001 to $2000	1	1.0	1	5.3
Over $2000	1	1.0	0	0.0

[a] For COSTHELP, mean in non-AGR is greater than AGR at α = .0317 level.

Table 58. Strategies: PAA on CUP applications and acceptance of PAA (ACCEPPAA).

	AGR Permits		Non-AGR Permits	
PAA	Frequency	Percent	Frequency	Percent
CUP to be granted exactly as requested	91	83.5	13	65.0
CUP to be granted but in a modified form	17	15.6	6	30.0
CUP not to be granted	1	0.9	1	5.0

	AGR Permits		Non-AGR Permits	
ACCEPPAA	Frequency	Percent	Frequency	Percent
Yes	108	98.2	17	85.0
No	2	1.8	3	15.0

Table 59. Strategies: APPCHANG, WMDCHANG, and ACTION.

	AGR Permits		Non-AGR Permits	
APPCHANG	Frequency	Percent	Frequency	Percent
Yes	1	0.9	2	10.0
No	110	99.1	18	90.0
	AGR Permits		Non-AGR Permits	
WMDCHANG	Frequency	Percent	Frequency	Percent
Yes	1	0.9	2	9.5
No	108	99.1	19	90.5
	AGR Permits		Non-AGR Permits	
ACTION	Frequency	Percent	Frequency	Percent
Yes	0	0.0	1	5.3
No	109	100.0	18	94.7

Table 60. Strategies: percentage of contacts with applicants (PREPAA, POSTPAA, and PREFAA), as perceived by District board and staff.

	PREPAA		POSTPAA		PREFAA	
Percentage	Frequency	Percent	Frequency	Percent	Frequency	Percent
< 20	18	69.2	11	44.0	9	36.0
21 to 40	3	11.5	3	12.0	3	12.0
41 to 60	1	3.8	3	12.0	4	16.0
61 to 80	2	7.7	3	12.0	4	16.0
81 to 100	2	7.7	5	20.0	5	20.0

Table 61. Strategies: past, present, and future actions to be taken (TRANSFER, USEWATER, and RENEW).

	AGR Permits			Non-AGR Permits		
CUP Status	N	Frequency	Percent	N	Frequency	Percent
TRANSFER	115	1	0.9	25	0	0.0
USEWATER	112	83	74.1	24	21	87.5
RENEW	111	109	98.2	25	24	96.0

individual contacts between applicant and staff or board must be determined by discussion with each staff or board member, since no list of such contacts exists at the present time. Most contacts were made prior to receipt of the PAA (PRECON) and few contacts were needed afterward (POSTCON), due to the fact that most CUPs were granted as requested (Table 58).

Less than one third of all respondents indicated "Yes" for either WAIVLIM, OVRESTIM, or MEETINGS, the summary data for which are shown in Table 54. Additionally, an attempt was made to elicit further information concerning attendance at District meetings. A roster is placed in the meeting room at the time of each meeting, but signing of the roster is voluntary. The formal minutes of the District meetings therefore present interesting data on some parties, but may not be construed as containing complete attendance data. Archival data sources in the District were examined for these and other data, but no additional references or lists were uncovered.

Tables 55, 56, and 57 display transactions costs data for COSTTIME, COSTCASH, and COSTHELP, respectively. Approximately 90 percent of AGR respondents spent 7 days or less and $500 or less. All three costs were shown to be higher for non-AGR respondents.

In Table 58, the decision of the District and the response of the applicant are shown in summary form. PAA for both AGR and non-AGR was predominantly (at least 95 percent) that the permit would be granted, either in original or somewhat modified form. Naturally, the response to this was that 98 percent of AGR and 85 percent of non-AGR accepted the decision. This was supported by archival evidence suggesting that only a very small percentage of applicants were actually denied a CUP, once they have properly entered and passed through the review process. Accordingly, there were not many changes made by either AGR or non-AGR applicants, or by the District, as shown in Table 59.

The percentage of contacts, as perceived by District board and staff, is presented in Table 60. During the early contact period (PREPAA), approximately 80 percent of board and staff had contact with 40 percent or less of applicants. During the next contact period (POSTPAA), only 56 percent of board and staff had contact with 40 percent or less of applicants. Finally, during the last contact period (PREFAA), the percentage of board and staff having such contact dropped to 48 percent. This is most likely a function of specific job description, but may also indicate the decreasing need of applicants to seek assistance from board and staff during the later stages in the application process.

In the last presentation of summary data that concerns strategy, Table 61, the tendency for both AGR and non-AGR respondents was to have retained (and not have transferred) the permit, to actually use the water specified on the permit, and to expect to renew the permit.

Predictive Analysis and Payoff Functions

Chapter IV presented four suggested forms of the payoff function, in equations (4.12), (4.13), (4.14), and (4.15). These four payoff functions were tested using PROC GLM and the results are presented in Tables 62, 63, 64, and 65.

The R^2 values in the PERAVWD and PERMAXWD models (0.860 and 0.973, respectively) were substantially greater than those in the INDEXAV and INDEXMAX models (0.212 and 0.027, respectively).

In the PERAVWD model, REQAVWD, CONTACTS*CLASS, STRAT3*CLASS, and TC*MSDIFATT had coefficients different from zero (at the $\alpha \leq 0.10$ level). The coefficient on REQAVWD was positive, as expected, and suggested that for every unit of water requested, the permitted amount increased by 0.76 units. The CONTACTS*CLASS coefficient was shown to have a positive sign, implying that one more contact by AGR had more of an impact on obtaining water than did the same marginal contact by non-AGR. This could mean that the WMD is more attentive to AGR interests, or simply that AGR applicants have a more harmonious working relationship with the District. Similar conclusions apply for the STRAT3*CLASS coefficient, wherein one more strategy resulted in a larger payoff for the AGR applicant than for the non-AGR applicant. The parameter estimated for TC*MSDIFATT

Table 62. Predictive analysis: payoff function (4.12).

Model: $PERAVWD = a_0 + a_1CLASS + a_2REQAVWD + a_3MSDIFATT + a_4CONTACTS + a_5STRAT3 + a_6TC + a_7DATEISSU + a_8REQAVWD*CLASS + a_9MSDIFATT*CLASS + a_{10}CONTACTS*CLASS + a_{11}STRAT3*CLASS + a_{12}TC*CLASS + a_{13}DATEISSU*CLASS + a_{14}CONTACTS*MSDIFATT + a_{15}STRAT3*MSDIFATT + a_{16}TC*MSDIFATT$

DF (n - 1): 133 $\alpha = 0.0001$ R^2: 0.860

Coefficient	Estimate	Std. Err. Est.	PR > |T|
a_0	16360.14	30143.88	0.5883
a_1	-16945.92	30168.84	0.5754
a_2	0.76	0.06	0.0001
a_3	-245.17	1063.27	0.8180
a_4	-1420.69	933.80	0.1309
a_5	1114.13	762.41	0.1466
a_6	-0.37	0.64	0.5678
a_7	-0.02	0.04	0.6226
a_8	0.23	0.44	0.6003
a_9	-429.41	874.86	0.6245
a_{10}	1481.57	728.43	0.0442
a_{11}	-1381.44	747.75	0.0672
a_{12}	0.17	0.51	0.7324
a_{13}	0.02	0.04	0.6065
a_{14}	281.78	449.85	0.5323
a_{15}	347.33	346.49	0.3182
a_{16}	0.91	0.53	0.0861

Table 63. Predictive analysis: payoff function (4.13).

Model: $\text{PERMAXWD} = b_0 + b_1\text{CLASS} + b_2\text{REQMAXWD} + b_3\text{MSDIFATT} + b_4\text{CONTACTS} + b_5\text{STRAT3} + b_6\text{TC} + b_7\text{DATEISSU} + b_8\text{REQMAXWD*CLASS} + b_9\text{MSDIFATT*CLASS} + b_{10}\text{CONTACTS*CLASS} + b_{11}\text{STRAT3*CLASS} + b_{12}\text{TC*CLASS} + b_{13}\text{DATEISSU*CLASS} + b_{14}\text{CONTACTS*MSDIFATT} + b_{15}\text{STRAT3*MSDIFATT} + b_{16}\text{TC*MSDIFATT}$

DF (n - 1): 133 $\alpha = 0.0001$ R^2: 0.973

Coefficient	Estimate	Std. Err. Est.	PR > |T|
b_0	-2934.57	17358.10	0.8660
b_1	2203.68	17372.86	0.8993
b_2	0.81	0.02	0.0001
b_3	-1378.14	611.86	0.0262
b_4	-1012.43	535.38	0.0611
b_5	-27.79	446.98	0.9505
b_6	-1.35	0.37	0.0004
b_7	0.01	0.02	0.7749
b_8	0.19	0.05	0.0007
b_9	283.91	503.89	0.5742
b_{10}	932.32	415.86	0.0269
b_{11}	-133.14	438.12	0.7617
b_{12}	0.97	0.28	0.0008
b_{13}	-0.00	0.02	0.8216
b_{14}	578.87	258.54	0.0270
b_{15}	322.29	198.80	0.1077
b_{16}	1.39	0.30	0.0001

Table 64. Predictive analysis: payoff function (4.14).

Model: $\mathrm{INDEXAV} = c_0 + c_1\mathrm{CLASS} + c_2\mathrm{MSDIFATT} + c_3\mathrm{CONTACTS} + c_4\mathrm{STRAT3} + c_5\mathrm{TC} + c_6\mathrm{DATEISSU} + c_7\mathrm{MSDIFATT{*}CLASS} + c_8\mathrm{CONTACTS{*}CLASS} + c_9\mathrm{STRAT3{*}CLASS} + c_{10}\mathrm{TC{*}CLASS} + c_{11}\mathrm{DATEISSU{*}CLASS} + c_{12}\mathrm{CONTACTS{*}MSDIFATT} + c_{13}\mathrm{STRAT3{*}MSDIFATT} + c_{14}\mathrm{TC{*}MSDIFATT}$

DF (n - 1): 133 $\alpha = 0.0084$ R^2: 0.212

Coefficient	Estimate	Std. Err. Est.	PR > |T|
c_0	8.33	16.34	0.6112
c_1	-8.08	16.35	0.6221
c_2	-0.57	0.57	0.3160
c_3	-0.22	0.50	0.6567
c_4	-0.07	0.40	0.8690
c_5	-0.00	0.00	0.1707
c_6	-0.00	0.00	0.6889
c_7	0.24	0.46	0.5989
c_8	0.66	0.39	0.0948
c_9	-0.16	0.39	0.6865
c_{10}	0.00	0.00	0.2574
c_{11}	0.00	0.00	0.6578
c_{12}	0.03	0.24	0.9163
c_{13}	0.17	0.19	0.3789
c_{14}	0.00	0.00	0.1194

Table 65. Predictive analysis: payoff function (4.15).

Model: $\mathrm{INDEXMAX} = d_0 + d_1\mathrm{CLASS} + d_2\mathrm{MSDIFATT} + d_3\mathrm{CONTACTS} + d_4\mathrm{STRAT3} + d_5\mathrm{TC} + d_6\mathrm{DATEISSU} + d_7\mathrm{MSDIFATT{*}CLASS} + d_8\mathrm{CONTACTS{*}CLASS} + d_9\mathrm{STRAT3{*}CLASS} + d_{10}\mathrm{TC{*}CLASS} + d_{11}\mathrm{DATEISSU{*}CLASS} + d_{12}\mathrm{CONTACTS{*}MSDIFATT} + d_{13}\mathrm{STRAT3{*}MSDIFATT} + d_{14}\mathrm{TC{*}MSDIFATT}$

DF (n - 1): 133 $\alpha = 0.9981$ R^2: 0.027

Coefficient	Estimate	Std. Err. Est.	PR > |T|
d_0	0.42	23.29	0.9856
d_1	0.74	23.31	0.9748
d_2	-0.65	0.81	0.4210
d_3	-0.46	0.72	0.5219
d_4	-0.05	0.57	0.9334
d_5	-0.00	0.00	0.5525
d_6	0.00	0.00	0.9509
d_7	0.16	0.66	0.8042
d_8	0.35	0.56	0.5358
d_9	-0.05	0.55	0.9224
d_{10}	0.00	0.00	0.8266
d_{11}	-0.00	0.00	0.9627
d_{12}	0.29	0.35	0.3989
d_{13}	0.10	0.27	0.7148
d_{14}	0.00	0.00	0.6289

was found to be positive, as hypothesized, meaning that applicants got more additional response for any given marginal expenditure of effort when MSDIFATT was larger.

In the PERMAXWD model, REQMAXWD, MSDIFATT, CONTACTS, TC, REQMAXWD*CLASS, CONTACTS*CLASS, TC*CLASS, CONTACTS*MSDIFATT, and TC*MSDIFATT had coefficients different from zero, at the $\alpha \leq 0.10$ level. STRAT3*MSDIFATT had a coefficient different from zero, at just above the $\alpha = 0.10$ level. As hypothesized, a larger difference in attitudes resulted in less success in gaining water, shown by the negative sign on MSDIFATT. However, the positive (and significant) signs on the interactions between MSDIFATT and each of the effort variables (CONTACTS, STRAT3, and TC) suggest that differences in attitudes can be overcome by more effort. The negative sign on CONTACTS was not hypothesized. It suggests that one more contact actually reduced the payoff. However, it is the first derivative of the function that must be considered, as given by

-1012.43 +932.32*CLASS +578.87*MSDIFATT

Thus, one more contact could increase the amount of the payoff if CLASS=1 (which is AGR) and if MSDIFATT is sufficiently high. For the AGR group, using the mean MSDIFATT (discussed below), the derivative has the value of 452, so contacts increased the payoff. For the non-AGR group, that derivative has the value of -439 at the mean MSDIFATT for that group, but increases to -98 for MSDIFATT one standard deviation above the mean. While still negative, an increase in contacts has a more positive influence for larger values of MSDIFATT, as for the AGR case. The TC coefficient was also found to be highly significant, with a negative sign, the latter not being expected. However, again finding the derivative gives

$$-1.35 + 0.97*CLASS + 1.39*MSDIFATT$$

which suggests that the impact of TC is positive for the AGR group at any value of MSDIFATT greater than 0.27, which is highly probable (Table 66). For the non-AGR group, the impact of increasing TC is positive for MSDIFATT greater than 0.97, or for values near the mean MSDIFATT or greater. The same general conclusions can be made for the other effort variable, STRAT3, but the coefficient on STRAT3 is not significant. In general, the result for the effort is as expected, in that more effort pays when the MSDIFATT is larger. The coefficient on REQMAXWD*CLASS was found to be highly significant, and positive, meaning that AGR requests were more likely to be honored. In fact, the coefficient was 0.19, which when added to that of REQMAXWD, gives exactly 1.00. Thus, 100 percent of the request is honored for AGR applicants, while only 81 percent is the payoff for the non-AGR group.

In the INDEXAV model, only one of the coefficients, for CONTACTS*CLASS, was different from zero at the $\alpha \leq 0.10$

level. In the INDEXMAX model, none of the coefficients were significantly different from zero.

The means of the variables used in models (4.12), (4.13), (4.14), and (4.15) are shown in Table 66. Means by CLASS are not significantly different for INDEXAV, INDEXMAX, MSDIFATT, CONTACTS, and STRAT3.

PROC CORR was used to test for the presence of multicollinearity. Table 67 presents the Pearson correlation coefficients having rho values significantly different from zero, at the $\alpha \leq 0.10$ level. There is no evidence of multicollinearity between any two of the explanatory variables. The absolute value of rho between TC and CLASS was 0.43704, and this was the maximum. MSDIFATT and DATEISSU had no significant correlation with any other variables tested.

The correlation coefficient for PERAVWD and REQAVWD is 0.91997; the square of this term is 0.846, almost equal to the R^2 of 0.860 for the entire model. Similarly, the correlation coefficient for PERMAXWD and REQMAXWD is 0.96890; the square of this term is 0.939, almost equal to the R^2 of 0.973 for the entire model. The quantity of water requested, expressed as REQAVWD or REQMAXWD, does much to explain the quantity of water permitted, expressed as PERAVWD or PERMAXWD.

Table 66. Number of observations (N), means, and standard deviations (S.D.) for variables in payoff functions (4.12) through (4.15).

	AGR Permits			Non-AGR Permits		
Variable	N	Mean	S.D.	N	Mean	S.D.
PERAVWD[a]	119	222.35	886.98	26	4473.40	6728.07
REQAVWD[a]	119	162.32	347.99	26	4235.94	6695.27
PERMAXWD[a]	119	1128.29	2163.56	26	6208.50	8215.10
REQMAXWD[a]	119	1007.86	1596.24	26	6625.29	9361.41
INDEXAV[b]	119	1.22	0.75	26	1.06	0.36
INDEXMAX[b]	119	1.21	0.98	26	1.03	0.21
MSDIFATT[b]	118	0.92	0.56	26	0.99	0.59
CONTACTS[b]	117	1.21	0.55	20	1.25	0.55
STRAT3[b]	116	0.44	0.55	21	0.48	0.51
TC[a]	117	231.21	523.94	21	1033.38	913.24

[a] Means by CLASS (AGR, non-AGR) are different, at $\alpha < 0.01$ level.

[b] Means by CLASS are not different.

Table 67. Pearson correlation coefficients for variables in payoff functions (4.12) through (4.15), with PR > |RHO|, and number of observations.

	PERAVWD	REQAVWD	PERMAXWD	REQMAXWD	INDEXAV	CLASS	CONTACTS	STRAT3
REQAVWD	0.91997 0.0001 145	--	--	--	--	--	--	--
PERMAXWD	0.94249 0.0001 145	0.89122 0.0001 145	--	--	--	--	--	--
REQMAXWD	0.93192 0.0001 145	0.94387 0.0001 145	0.96890 0.0001 145	--	--	--	--	--
INDEXAV	--	--	0.13915 0.0951 145	--	--	--	--	--
INDEXMAX	--	--	--	--	0.28373 0.0005 145	--	--	--
CLASS	-0.48938 0.0001 145	-0.48764 0.0001 145	-0.44426 0.0001 145	-0.46125 0.0001 145	--	--	--	--
CONTACTS	0.15419 0.0720 137	--	0.20908 0.0142 137	--	0.34904 0.0001 137	--	--	--
STRAT3	0.22744 0.0075 137	0.16997 0.0471 137	0.27189 0.0013 137	0.21968 0.0099 137	--	--	0.18627 0.0299 136	--
TC	0.58856 0.0001 138	0.49572 0.0001 138	0.63359 0.0001 138	0.53793 0.0001 138	0.16303 0.0561 138	-0.43704 0.0001 138	0.31968 0.0002 135	0.28257 0.0009 134

CHAPTER VI
DISCUSSION AND CONCLUSIONS

Discussion

At this point, the eight components of the game are combined with the descriptive and predictive analyses, as well as with the player characteristics, attitudes, and strategies, to present an overview of the CUP process as seen in the SWFWMD during the time periods of interest. In using process analysis, one finds a curious blend of reductionistic and holistic thinking. That is, the parts become the foci at times, whereas the whole becomes the focus at other times. Both views are needed, however, and the process analyst is merely employing different levels of aggregation to comprehend the phenomenon or phenomena at hand.

Descriptive Overview of the Game

By far the largest participant group in the game was AGR, with 5188 permits as compared to 173 IND and 495 PUB (Table 3), and most applicants were also the owners of the CUPs (Table 9). The PUB category included a much larger political power base, however, because several million people were served by the 495 PUB permits. One would expect that it is easier to get a permit with that type of political influence. However, District board and staff indicated that AGR has the least difficulty in obtaining a CUP, followed by PUB, and then IND (Table 49). The attitudinal data suggest that power, wealth, and influence were not perceived as important forces (Table 23), indicating an honest and open permitting process. The same consistency was revealed with respect to water supply authorities. While these entities aggregate over a large number of people, many respondents were undecided over the impact of their requests as compared to those of other applicants (Table 24). Applicants were less sure than board and staff about the power and influence of these authorities, and AGR interests expressed the most concern about such influence. Large corporations and businesses were not seen as more likely to gain a CUP, although there was some indecision on the point (Table 32). Overall, power does not seem at issue.

There was more evidentiary status (Table 10), as well as a greater number of stipulations (Table 11), in non-AGR permits, which might suggest that the smaller user is less likely to be scrutinized closely. Another possibility is that consumptive use by an individual is small and does not lead to filed claims of problems leading to evidentiary status. There was also much greater standard deviation in NRSTIP for the non-AGR permit as compared to the AGR permit, at three times the mean. The number of groundwater and surface water withdrawal points (Table 11) as well as permitted and requested quantities (Table 66) were greater in the non-AGR group, which was evidence of the generally larger scale, and in some cases scope, of the non-AGR users.

A striking feature is the consistently high level of education achieved by all participants (Table 13). This fact contributes to cooperation in the system, as those with similar educational levels are likely to communicate more effectively. Also, there is a similar age composition (Table 12), which also contributes to harmony in relations.

Income distributions were unequal for AGR and non-AGR respondents (Table 14) and yet higher income was not seen as a deciding factor (Table 29). This also indicates that the process was perceived as honest and open, although both AGR and non-AGR were more uncertain than the board and staff.

There was a large amount of agreement in the system. MSDIFATT was not significantly different between AGR and non-AGR (Table 66), and most differences in Table 44 were small and on the same side of the uncertainty mid-point. The 27 parts of survey question 1 shed further light on the inherently cooperative setting in the SWFWMD with respect to the CUP process.

Over two-thirds agreed that the CUP system is needed (Table 17). There were only 15 to 20 percent who felt that it is not. Similarly, over two-thirds indicated that the WMD is an important and useful agency (Table 18). From 10 to 20 percent saw some need for improvement (Table 18).

Most were concerned about population growth and expressed feelings suggesting that water should not be used to fuel the growth process (Table 19). Scarcity was in the sights of most (Table 20), which likely influenced perceptions of the role of water in the growth process. It is interesting to note, however, that the present game was not viewed as zero-sum by respondents. Thus, water allocation, with gainers and losers resulting from the CUP process, was not seen as a central issue (Table 37). The perception of scarcity supports the tendency to favor water conserving technologies, but at some hesitancy if profits are lowered in the process (Table 21). Water conserving technology was generally favored more by the board and staff than by the applicants (Table 21). However, when faced with explicit choices concerning technological change, all respondents placed about the same weight on water conservation (Table 46).

The sense of future scarcity is also consistent with the expressed belief that it is important to lay claim to water immediately, justifying expenditure of time and money to do so (Table 22). The currency of the matter is real, with 65 to 80 percent of all respondents believing it important to get a permit now. Applicants saw a more definite link between current consumptive use permits and the future economic vitality of their businesses than did the board and staff (Table 30). Although Table 45 shows that over one-third of all respondents felt that present competition for water was nonexistent, Table 26 indicates that over 72 percent of respondents were concerned about future competition for available water. AGR was more concerned than was non-AGR.

The perceived lack of present competition, which may be indicative of the view that water is not yet a binding economic constraint, seems to agree with those views expressed in informal interviews with political agents within the SWFWMD. The process was therefore seen by some to be other than an allocative mechanism, at least during the time periods of interest.

The actual process functions smoothly. Most found the procedures to be clear and logical (Table 25). There was general agreement on the sufficiency of information (Table 39), although 30 to 40 percent would like additional information. Again, the system apparently operates in the open.

Staff and board were thought of as fair in dealings with applicants, although there was some indecision on this matter (Tables 27 and 28). AGR applicants placed the most faith in the system with respect to honesty in requests for water (Table 31). Most respondents indicated that it is best to avoid conflict (Table 33), which likely means that the system does not cause, but rather tempers, conflict among the participants. It was believed, especially among AGR interests, that changes can be made in the system to improve matters (Table 34) and that the process is therefore receptive to feedback.

The applicants apparently take active roles in the process, as most viewed strategy and an active approach as much more important than luck and chance (Table 36). Most respondents felt that the process is not automatic or "rubber-stamp" in nature (Table 38). AGR users were more likely to believe that the staff makes CUP allocation decisions, although many applicants were undecided (Tables 41 and 43).

The state water policy banning interdependencies among neighboring wells would likely be supported by the participants in this study, since most agree that CUPs should not be granted that will affect the wells of others (Table 40). There is apparently a sense of "first in time, first in right" among the participants, which is conditioned by the need to protect the resource for future generations (Table 42) and the belief that "individual pleasure and satisfaction" from water use is low on the scale of importance (Table 35). The latter is perhaps tied to a societal productivity ethic held by almost all respondents. The concern for future generations was found to be the strongest in the board and staff, which was followed by AGR, and then by non-AGR permit holders. This result implicitly suggests a stronger conservation ethic in the board, staff, and AGR than in the non-AGR group. However, AGR users tended to be both slightly less and slightly more disposed toward adopting water conserving technologies (Tables 21 and 46), and thus are somewhat inconsistent. This fact could be due to the general inability of farmers to immediately pass on costs of water-using technologies, as compared to other groups. Also, there was some further inconsistency as AGR permit holders tended to be more favorably disposed toward rapid growth (Table 19), which may be indicative of the potential value of farmland that is sold to the urban sector.

Overview of Predictive Modeling

The theoretical framework suggests that the process is dynamic, ever changing, with considerable feedback in the system from the participants. The complexity is considerable, and the state of the art in modeling such intertwined socio-politico-economic systems is rudimentary at best. Yet, simple models often provide the best insights and this was the reason for using the single equation predictive model.

The CUP process has experienced several changes in rules and regulations since the time of the initial legislation. The original 1972 Act, in conjunction with these subsequent changes, has managed to minimize conflict among participants, given the available water supplies in the study area. There was no clear pattern of the causal forces behind the changes, but there was also no evidence to deny the Ruttan hypothesis of economic advantage in driving institutional change.

There is a process at work, however, that cannot be ignored, nor is it being ignored, by those wishing to participate in a viable state economy in the future. While very few permits have been denied, it also became obvious from the survey data that participants are taking the process seriously. Effort is being spent to insure future claims on water. It thus is of interest to examine the major forces yielding success in attaining a permit.

Success, measured in the payoff, was viewed as being a function of the amount of effort placed into the process, from the most simple request for a certain amount of water, to the complexity of mixing that request with legal services, attending meetings, and contacting board and staff personnel. Other explanatory variables included the characteristics of the players (especially the consumptive use category to which an applicant belonged), the variance in attitudes between the applicant and the District, and the year in which the permit was issued.

It was discovered that very few applications resulted in an INDEXAV and INDEXMAX of 0.0 to 0.5, and most received almost exactly what was requested. Indeed, many applicants received more than the original request, thus refuting the assumptions of equations (4.5) and (4.6). This was interpreted to be the product of (1) staff efforts to provide technically correct calculations on applications and (2) the cooperative scenario that develops between the staff and applicant.

Such a result is especially descriptive for AGR applicants, who often rely heavily upon the calculations and professional judgement of staff members. It has been suggested that non-AGR (IND and PUB) applicants may have greater access to, or make greater use of, legal and engineering consultants before meeting with District staff, and therefore may not need staff assistance to the same extent as the AGR applicants. Many respondents specified that their main, or only, contact was a WMD staff member (Table 53). Acceptance of District decisions was generally the rule (Table 56). Accordingly, the incidence of APPCHANG, WMDCHANG, and ACTION was quite small (Table 57).

The variance in attitudes, given by MSDIFATT, had the expected negative sign in all four models presented (Tables 5, 62, 63, 64, and 65), but was significant only in model (4.13). The general non-significance is likely due to the fact that technical criteria and adherence to appropriate algorithms are the most important considerations, from the District's point of view. One interpretation is that the applicant, in perceiving that a disparity existed between his views and those of the District, tried to be even more cooperative or pursued the permit more aggressively. Another interpretation is that attitude differences actually widened as a result of the permitted amount, and that the parameter on MSDIFATT is measuring the ex post impact of conflict and disagreement, or agreement, between the applicant and board/staff.

In general, more effort leads to a greater payoff. That is, higher levels of contacts, more intensive strategy, and higher expenditures resulted in access to more water, especially if there were wider differences in attitudes between applicant and District. However, as noted, most applicants were permitted almost exactly what was requested, and in fact, were given more than their request in many cases. While additional effort was statistically significant, the absolute and economic significance of this variable was not crucial during the study period.

An especially important variable is TC. Transactions costs are one indication of how much difficulty is involved in order for two or more parties to negotiate, communicate, or otherwise come to any sort of agreement on the matter at hand. The TC considered herein (Tables 5, 55, 56, 57, and 66) were analyzed in both the descriptive and predictive sense. TC were found to be significant in model (4.13) and had significant interaction terms in models (4.12) and (4.13). In model (4.12), this indicates that an increase in TC would increase the payoff. In model (4.13), an increase in TC could increase the payoff, depending upon the CLASS and MSDIFATT, since the TC coefficient is negative and those of the interaction terms are positive.

In summary, the payoff model analysis for the applicants suggests three points. First, the most important strategy to getting a consumptive use permit is simply to ask. Second, while strategy and transactions costs were statistically significant, their real influence during the study period was not absolutely or economically significant. However, the fact that there was statistical significance suggests the strategy and amount spent (in time and money) could be important indicators of success in an absolute sense in the future as water supplies become more scarce. Third, differences in attitudes appeared to be significant indicators of success at getting a certain amount of water, with the greater differences reflecting less success. However, it is not known to what extent the attitudes were shaped by the actual permitting process, so it is impossible from these results to conclude if attitude differences were a causal or a resulting factor in the permitted amounts of water.

Conclusions

A game was found to be in progress within the WMD system in the state of Florida, involving several players. Four of these players were (1) AGR users, (2) IND users, (3) PUB users, and (4) the SWFWMD BOARD and STAFF.

Additionally, it became clear that water management under the present administrative water doctrine in Florida had to be classed as non-market. Due to the absence of actual ownership of water as a resource, there are no real loci in two-dimensional, supply/demand space, since no water rights exist to enable market prices to be revealed.

Thus, the institutions that form the basis for Florida water management emerge as factors in influencing income distributions. The 1972 Florida Water Resources Act, which views water as a common property resource, has produced an economic environment in which economic agents attempt to establish a more favorable set of rights that will move them toward a better defined, less attenuated property-rights structure.

The Ruttan-Hayami model of induced institutional change, coupled with their pattern model that considers cultural endowments, may be used with game theory to better comprehend how agents have been trying to establish a rights structure that would alter the outcome in their favor. This outcome appears in the form of a payoff. By specifying rights to water, even indirectly or in the most subtle fashion, these agents have likely been endeavoring to protect net income streams over time, which involve revenues or costs attributable to water production or consumption, and modification of uncertainty related to water availability over time.

The evidence suggests that a cooperative, open scenario prevails between the AGR/IND/PUB and BOARD/STAFF players, with little alteration of rules or positive and/or negative feedback at that level of interaction. It is important to note that there is little or no conflict within the WMD consumptive permitting system concerning present use, since there is no perception of present water scarcity. Competition and allocation are of relatively little concern for the present. There is, however, a real concern for future scarcity and the conflict it will bring. This has driven economic agents to deliberately (in the Schotter sense) create an institutional arrangement to ensure their future rights and access to water. By obtaining consumptive use permits now and thereby establishing prior reasonable-beneficial use, this end is achieved. This is a central feature of the emerging water institutions in the state. Power, wealth, and influence are not seen as deciding factors in the permit process.

It follows the permitting process is economically efficient, because with no scarcity, the efficient solution is to allocate permits to every individual and group that displays at least some modicum of technical efficiency. For example, if irrigation managers are not wasting water to excessive deep percolation or runoff, and are gaining the most yield for every unit of water used, they are technically efficient. The technical criterion being used by the board and staff is oriented in this direction. Similarly, because nearly everyone has been given a permit, and because there was no apparent evidence from the survey results regarding the existence of favors to those with more power, wealth, and influence, it must be concluded that the permit process is also equitable. The 1972 legislation essentially requires that everyone be given a permit as long as it is in the public interest. Satisfying the public interest means primarily achieving technical efficiency in the case of consumptive use permits, which is a major consideration in the current system.

The entire CUP process one observes in the WMD system is functioning in part as an information channel. The applicant, WMD staff, and WMD board all exchange information in a cooperative setting.

The potential CUP applicant contacts the WMD, and if the withdrawal rate exceeds specified levels, then an application for a CUP must be completed. The WMD staff will review the application and ask for any information that is needed, in order to complete the form. The applicant might not possess accurate data as requested and the staff will determine the correct values, using a set of previously established guidelines. Such guidelines are often generated by the university system, especially for AGR users. When the form is complete, it is submitted to the WMD governing board for a final decision, which quite often is in accord with staff recommendations. The applicant generally will be granted the CUP at the end of the process.

From the WMD's point of view, the information or data thus collected is used to make rational decisions in a regulatory environment. This information may be used to explain and/or predict.

From the applicant's point of view, the information exchange results ultimately in a CUP and the income stream that flows from that CUP. The class into which an applicant is placed, the average and maximum withdrawal rates per day, the date of expiration of the CUP, and potential WMD actions to be taken in the event of water shortage, are all examples of information each applicant obtains in the process. Such information may describe the binding constraints imposed on the CUP applicant or holder. Alternatively, this information may be viewed as part and parcel of the attenuated property-rights structure the CUP applicant faces, with its attendant risk and uncertainty effects.

The supergame, or iterative environment-rich game, is very likely being played at a higher level than the one selected for the present study, as suggested in the previous discussion of the role of the legislature and lobbying efforts. At that level, players, strategies, rules, and payoffs would change over time. That is, legislators and lobbyists would come and go, thus altering the nature of a central decision-making body. Lawmakers would modify the explicit rules of the game. As the economy of the region, state, nation, and world vary over time, so would the real or potential payoffs. Players would be expected to interact with each other, and learn from these encounters over time. The game is no longer the single, static "m x n matrix" presented in introductory textbooks.

Water allocation via administrative law, as evolving from the 1972 Florida Water Resources Act, is perhaps most appropriate when water is not scarce. Serious scarcity may pose problems that the current WMD system cannot solve, but which may be ameliorated by market or quasi-market structures. Political decision-makers apparently believe that water is not scarce at present and that only improved management and/or technologies are required in the future. A technological solution may provide adequate water, but at a cost that society may not be able to afford. Socio-economic based solutions may come closer to contributing to the maximization of social welfare. *

It is significant that the current permitting process, while in some sense simply an information exchange, is also the first step toward establishing a right to use water in the future. The permitting process is the vehicle by which applicants can insure that they have access to water and thus a role in the economic future of the state. The applicants are sensitive to this perspective, are taking the process seriously, and are expending at least some effort to gain the future payoff. WMD board and staff members can expect increasing effort by applicants as economic development proceeds and brings expanding competition for the available water.

Recommendations

As with all phenomena, the payoffs for the state or government possess qualitative, quantitative, spatial, and temporal attributes. It was suggested previously that the quantification or qualification of these payoffs may pose difficulties for the economic scientist (given the current state of the art in economics), and that such efforts may be appropriately assigned to the domain of the political scientist. However, the attempt was made herein to specify in a rudimentary fashion some aspects of the qualitative payoffs to the District. It seems that future efforts could benefit from a multi-disciplinary approach.

A need clearly exists for additional analysis of two groups of players not included in the present investigation. The first group includes lawmakers and politicians at the state and local levels (especially the Florida Legislature). This group creates many of the explicit rules of the game; it also interacts with and receives input from lobbying groups. Such lobby and/or interest groups are likely related to the AGR, IND, and PUB groups, which may form subsets.

Furthermore, future research should be conducted so as to include data on all groups in the same time periods. In the present study, temporal overlap is not entirely satisfactory for the players. It was assumed that any WMD board or staff member who served after the 1972 Act was created may have had an effect on CUP applicants during the 1982-84 period. This is reasonable due to the creation of formal and/or informal rules that accumulate over time within any regulatory agency, as methods and approaches are added, tested, improved, or discarded. Additionally, low response to the survey necessitated the use of all available board and staff data, including data prior to the 1982-84 period of interest.

There are also tremendous shortcomings in the presently available data base in Florida necessary to calculate the economic payoff. The marginal value of water has been estimated for several Florida situations and user groups (including residential, commercial, and agricultural) in studies by Gibbs [1978], Lewis [1981], Lynne [1977, 1978, 1984], Lynne _et al_. [1979], and Wilkowske [1983]. Additional modeling that quantifies the average or marginal value product of water may be required in future analyses, similar to those presented by Colette [1976], Colette _et al_. [1976], and Lofting and McGauhey [1963]. Such values would be useful in estimating payoffs for specific sectors.

Improvements can also be made in the questionnaire. A discussion of these matters is presented in Appendix D. It is suggested that these and other changes be made and another study of the consumptive use permitting process be completed at an appropriate interval in the future, with the results herein used as a base point. Rigorous quantitative tests of the various theories of institutional change are also needed.

APPENDIX A
SURVEY INSTRUMENT:
CONSUMPTIVE USE PERMIT APPLICANTS

1. Please CIRCLE the NUMBER associated with your view on each of the following statements.

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
The CUP system is not needed........................	1	2	3	4	5
The Water District acts more as a useless "bureaucracy" than as an agency to serve the people....	1	2	3	4	5
Rapid population growth is good, and water should be used to help such growth......	1	2	3	4	5
Water will be scarce in parts of Florida before the end of this century.......	1	2	3	4	5
The latest water conserving technology should be required of all applicants, even if profits are lower............	1	2	3	4	5
The future financial/economic benefits of a water permit are great enough to justify spending time and money to get a CUP today....................	1	2	3	4	5
If you have more power, influence in the community, or higher social status, it is easier to get a CUP........	1	2	3	4	5
Water supply authorities, which represent groups of towns, cities, or counties, get CUPs more easily than individual applicants.........	1	2	3	4	5
The procedures used in applying for a CUP are clear and logical............	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
Getting a CUP now is important because of future competition for available water	1	2	3	4	5
The District staff is fair in its recommendations to the Governing Board, as to who should get a CUP	1	2	3	4	5
The District Governing Board is fair in assigning CUPs	1	2	3	4	5
An applicant with higher income can get a CUP more easily than someone with lower income	1	2	3	4	5
Getting a CUP is the same as staking a claim in the future economic activity of Florida	1	2	3	4	5
Requesting only the amount of water actually needed is the best strategy for getting a CUP	1	2	3	4	5
Large corporations or businesses are more likely to get CUPs than individuals or small businesses	1	2	3	4	5
The best strategy for getting a CUP is simply to use legal force, even if it leads to confrontation and conflict between the applicant and District staff or Governing Board	1	2	3	4	5
When the "system" doesn't work, an individual can help by informing administrators, legislators and others in positions of authority so the system can be improved	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
CUPs should be given to people who gain the most individual pleasure and satisfaction from the water use	1	2	3	4	5
Success in getting a CUP is due more to strategy and approach than it is to luck and chance	1	2	3	4	5
With the water permit system, the water that one user gains is water that must be given up by another user	1	2	3	4	5
In the past, getting a CUP has been mostly an automatic "rubber-stamp" process	1	2	3	4	5
When applying for a CUP, there is inadequate information about what to expect and the best way to fill out forms	1	2	3	4	5
A CUP application that would result in damage to a neighbor's wells should not be approved	1	2	3	4	5
The District staff really decides who gets a CUP, and not the Governing Board	1	2	3	4	5
Water users have a responsibility toward future generations to avoid damaging the groundwater system	1	2	3	4	5
The Governing Board is OFTEN required to evaluate problems that the District staff cannot see or analyze in CUP applications	1	2	3	4	5

IN THE QUESTIONS THAT FOLLOW, "TERMS" REFERS TO THE "TERMS AND CONDITIONS LETTER", WHICH WAS CALLED THE "PROPOSED AGENCY ACTION" STARTING OCTOBER 1984. THIS WAS THE FIRST NOTIFICATION SENT TO YOU OF THE DISTRICT'S INTENT (GRANT THE CUP EXACTLY AS YOU REQUESTED, GRANT THE CUP BUT IN A MODIFIED FORM, OR REJECT THE CUP APPLICATION).

2. Before receiving the TERMS, how did you classify your use(s) of water on this CUP? (Please CIRCLE all numbers that apply)

   1 PUBLIC SUPPLY

   2 AGRICULTURAL

   3 INDUSTRIAL

   4 OTHER (PLEASE SPECIFY) ______________________________

3. Before receiving the TERMS, who did you contact to help you process your CUP application at the District? (Please CIRCLE all numbers that apply)

   1 I DID NOT CONTACT ANYONE

   2 ANOTHER USER LIKE ME

   3 FAMILY MEMBERS

   4 COUNTY EXTENSION AGENT

   5 WATER MANAGEMENT DISTRICT STAFF MEMBER

   6 OTHER (PLEASE SPECIFY) ______________________________
   ____

4. (a) How much time went by, from the start of the application process until you received the TERMS? (Please CIRCLE only one number)

   1 30 DAYS OR LESS

   2 31 TO 90 DAYS

   3 91 DAYS TO 6 MONTHS

   4 OVER 6 MONTHS

   (b) Did you waive the 120-day time limit for the application process, to give yourself or the District more time? (Please CIRCLE only one number)

   1 YES

   2 NO

5. Before receiving the TERMS, did you feel that it was necessary to overestimate the amount of water needed to insure you got what you wanted? (Please CIRCLE only one number)

   1 YES

   2 NO

6. What did the Water District inform you, when you received the TERMS? (Please CIRCLE only one number)

   1 THE DISTRICT INFORMED ME THAT THE CUP WOULD BE GRANTED EXACTLY AS I REQUESTED——————————> SKIP TO QUESTION 9

   2 THE DISTRICT INFORMED ME THAT THE CUP WOULD BE GRANTED BUT IN A MODIFIED FORM

   3 THE DISTRICT INFORMED ME THAT THE CUP WOULD NOT BE GRANTED

7. Did you accept the Water District's decision in the TERMS, without taking any further action? (Please CIRCLE only one number)

   1 YES———> SKIP TO QUESTION 9

   2 NO

8. Let's look at the actions you needed to take.

   (a) After receiving the TERMS, did you attend any District meetings? (Please CIRCLE only one number)

   1 YES (HOW MANY MEETINGS: _______)

   2 NO

   (b) After receiving the TERMS, who did you contact to help you process your CUP application? (Please CIRCLE all numbers that apply)

   1 I DID NOT CONTACT ANYONE

   2 ANOTHER USER LIKE ME

   3 FAMILY MEMBERS

   4 COUNTY EXTENSION AGENT

   5 WATER MANAGEMENT DISTRICT STAFF MEMBER

   6 OTHER (PLEASE SPECIFY) ________________________________

8. (c) After receiving the TERMS, how did you classify your use(s) of water on the above CUP? (Please CIRCLE all numbers that apply)

1 PUBLIC SUPPLY

2 AGRICULTURAL

3 INDUSTRIAL

4 OTHER (PLEASE SPECIFY) ______________________________

(d) After receiving the TERMS, what CHANGES did you make on the CUP application? (Please CIRCLE only one number)

1 I DID NOT CHANGE THE
APPLICATION AT ALL----------> SKIP TO QUESTION 9

2 I MADE THE FOLLOWING CHANGES ON THE APPLICATION:
(PLEASE SPECIFY) ______________________________
____
____
____
____
____
____

(e) If you made any changes, why did you think the changes were needed? (PLEASE SPECIFY) ______________________________
____
____
____
____
____
____
____

9. (a) Did the Water District GOVERNING BOARD make any changes on your CUP, after you received the TERMS? (Please CIRCLE only one number)

1 YES

2 NO-----> SKIP TO QUESTION 10

(b) Did you take further action? (Please CIRCLE only one number)

1 YES (PLEASE SPECIFY) ______________________________
____
____
____

2 NO

10. Now let's look at what it cost you to get the CUP.

(a) How much time did you and other members IN YOUR ORGANIZATION (partners, family, employees) spend, in days, preparing for and actually working to get the permit, including attendance at District meetings? (Please CIRCLE only one number)

1 1 DAY OR LESS

2 2 TO 7 DAYS

3 8 TO 14 DAYS

4 MORE THAN 14 DAYS

(b) How much did this cost you, or your employer, in lost productivity and out-of-pocket costs?
(Please CIRCLE only one number)

1 $100 OR LESS

2 $101 TO $500

3 $501 TO $1000

4 $1001 TO $2000

5 MORE THAN $2000

(c) If you had help from OUTSIDE YOUR ORGANIZATION, what was the total cost of this assistance? (Please CIRCLE only one number)

1 $0

2 $1 TO $200

3 $201 TO $500

4 $501 TO $1000

5 $1001 TO $2000

6 OVER $2000

11. Who did you think would be your "competition" for water, under the existing system of water management?
(Please CIRCLE all numbers that apply)

1 I DIDN'T THINK THERE WAS ANY "COMPETITION"

2 PUBLIC SUPPLY USERS

3 AGRICULTURAL USERS

4 NON-AGRICULTURE INDUSTRIAL USERS

5 RECREATION/TOURISM

6 WILDLIFE, NATURAL SYSTEMS

7 REGIONAL WATER SUPPLY AUTHORITIES

8 THE WATER MANAGEMENT DISTRICT

9 OTHER (PLEASE SPECIFY) ______________________
____

10 DON'T KNOW

12. What would be TWO good reasons for changing to a different technology for water acquisition and/or use? Please put a "1" next to the most important reason, and a "2" next to the second most important reason.

____IT WOULD BE MORE COST EFFECTIVE FROM MY POINT OF VIEW

____IT WOULD BE MORE COST EFFECTIVE FROM SOCIETY'S POINT OF VIEW

____IT WOULD HELP ME TO OBTAIN A CUP, BECAUSE THE DISTRICT STAFF OR GOVERNING BOARD WOULD PREFER THIS TECHNOLOGY

____IT WOULD BE A TECHNOLOGY PREFERRED BY RESEARCHERS, SUCH AS THOSE AT UNIVERSITIES

____IT WOULD BE A TECHNOLOGY PREFERRED BY PEOPLE IN MY WATER USE CATEGORY (PUBLIC SUPPLY, INDUSTRIAL, AGRICULTURAL, OTHER)

____IT WOULD BE LIKELY TO CONSERVE WATER

____OTHER (PLEASE SPECIFY) ______________________________
____
____
____
____
____

13. How long has this business or agency been in operation? (Please CIRCLE only one number)

    1 LESS THAN 10 YEARS

    2 11 TO 20 YEARS

    3 21 TO 30 YEARS

    4 MORE THAN 30 YEARS

14. What is your age?____________

15. What is the highest level of education COMPLETED BY THE PERSON WHO ACTUALLY FILLED OUT THE CUP APPLICATION? (Please CIRCLE only one number)

    1 LESS THAN 9 YEARS

    2 9 TO 12 YEARS

    3 13 TO 16 YEARS

    4 MORE THAN 16 YEARS

16. Which of the following best describes the organization that has this CUP? (Please CIRCLE only one number)

    1 A BUSINESS OWNED BY ONE PERSON OR FAMILY

    2 A PARTNERSHIP, CORPORATION, OR OTHER JOINTLY OWNED BUSINESS

    3 A GOVERNMENTAL UNIT, SUCH AS A MUNICIPALITY, COUNTY, OR REGIONAL WATER SUPPLY AUTHORITY

17. IF YOU ANSWERED 1 OR 2 IN QUESTION 16: What was the business GROSS income in 1984, from activity dependent upon this CUP? (Please CIRCLE only one category)

    IF YOU ANSWERED 3 IN QUESTION 16: What was the 1984 budget in the agency responsible for obtaining this CUP? (Please CIRCLE only one category)

    LESS THAN $20,000

    $20,001 TO $40,000

    $40,001 TO $60,000

    $60,001 TO $80,000

    $80,001 TO $100,000

    $100,001 TO $150,000

    $150,001 TO $200,000

    $200,001 TO $500,000

    $500,001 TO $1,000,000

    MORE THAN $1,000,000

18. Has this CUP been transferred to someone else?
(Please CIRCLE only one number)

1 YES———> PLEASE STOP HERE

2 NO

19. Do you actually use the water permitted on your CUP?
(Please CIRCLE only one number)

1 YES

2 NO

20. Do you expect to renew this CUP? (Please CIRCLE only one number)

1 YES

2 NO

Please return the questionnaire in the enclosed postage-free envelope.
Thank you very much for your assistance.

Sincerely,

Gary D. Lynne
Associate Professor
University of Florida

Michael E. Wilson
Graduate Research Assistant
University of Florida

APPENDIX B
SURVEY INSTRUMENT:
WATER MANAGEMENT DISTRICT GOVERNING BOARD

1. Please CIRCLE the NUMBER associated with your view on each of the following statements.

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
The CUP system is not needed........................	1	2	3	4	5
The Water District acts more as a useless "bureaucracy" than as an agency to serve the people....	1	2	3	4	5
Rapid population growth is good, and water should be used to help such growth......	1	2	3	4	5
Water will be scarce in parts of Florida before the end of this century.......	1	2	3	4	5
The latest water conserving technology should be required of all applicants, even if profits are lower.............	1	2	3	4	5
The future financial/economic benefits of a water permit are great enough to justify spending time and money to get a CUP today.....................	1	2	3	4	5
If you have more power, influence in the community, or higher social status, it is easier to get a CUP........	1	2	3	4	5
Water supply authorities, which represent groups of towns, cities, or counties, get CUPs more easily than individual applicants.........	1	2	3	4	5
The procedures used in applying for a CUP are clear and logical.............	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
Getting a CUP now is important because of future competition for available water...............	1	2	3	4	5
The District staff is fair in its recommendations to the Governing Board, as to who should get a CUP..........	1	2	3	4	5
The District Governing Board is fair in assigning CUPs.....	1	2	3	4	5
An applicant with higher income can get a CUP more easily than someone with lower income..................	1	2	3	4	5
Getting a CUP is the same as staking a claim in the future economic activity of Florida....................	1	2	3	4	5
Requesting only the amount of water actually needed is the best strategy for getting a CUP.................	1	2	3	4	5
Large corporations or businesses are more likely to get CUPs than individuals or small businesses......	1	2	3	4	5
The best strategy for getting a CUP is simply to use legal force, even if it leads to confrontation and conflict between the applicant and District staff or Governing Board............	1	2	3	4	5
When the "system" doesn't work, an individual can help by informing administrators, legislators and others in positions of authority so the system can be improved..............	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDE-CIDED	DIS-AGREE	STRONGLY DISAGREE
CUPs should be given to people who gain the most individual pleasure and satisfaction from the water use	1	2	3	4	5
Success in getting a CUP is due more to strategy and approach than it is to luck and chance	1	2	3	4	5
With the water permit system, the water that one user gains is water that must be given up by another user	1	2	3	4	5
In the past, getting a CUP has been mostly an automatic "rubber-stamp" process	1	2	3	4	5
When applying for a CUP, there is inadequate information about what to expect and the best way to fill out forms	1	2	3	4	5
A CUP application that would result in damage to a neighbor's wells should not be approved	1	2	3	4	5
The District staff really decides who gets a CUP, and not the Governing Board	1	2	3	4	5
Water users have a responsibility toward future generations to avoid damaging the groundwater system	1	2	3	4	5
The Governing Board is OFTEN required to evaluate problems that the District staff cannot see or analyze in CUP applications	1	2	3	4	5

In the questions below, "TERMS" refers to the "TERMS AND CONDITIONS LETTER", which was called the "PROPOSED AGENCY ACTION" starting October 1984. This was the first notification sent to the applicant concerning the District STAFF'S intent (grant the CUP exactly as requested, grant the CUP but in a modified form, or reject the CUP application).

2. What percentage of ALL CUP applicants would contact you BEFORE receiving the TERMS? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

3. Of those CUP applicants who are told that the TERMS will be to modify or deny their first application, what percentage would contact you? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

4. Of those CUP applicants who are told that the BOARD plans to modify or deny their application, what percentage would contact you? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

5. Please characterize your working relationship with the District CUP staff, and other District personnel, with regard to the CUP process, during the years you were on the Board.
(Please CIRCLE only one number)

   1 EXCELLENT; CLOSE WORKING RELATIONSHIP ON CUP MATTERS

   2 STRONG; MODERATELY CLOSE WORKING RELATIONSHIP ON CUP MATTERS

   3 OK; ROOM FOR IMPROVEMENT

   4 FAIR; OCCASIONAL CONTACT AND DISCUSSION OF CUP MATTERS

   5 POOR; RARE DISCUSSION OF CUP MATTERS WITH THESE INDIVIDUALS

   6 NONE OF THE ABOVE; NOT MUCH NEED FOR CONTACT WITH THESE INDIVIDUALS

6. Please characterize how well your views/philosophies agreed with those of the other Board members, with regard to the CUP process, during the years you were on the Board.
(Please CIRCLE only one number)

   1 VERY CLOSE AGREEMENT

   2 MODERATELY CLOSE AGREEMENT

   3 FAIRLY CLOSE AGREEMENT

   4 LITTLE AGREEMENT

   5 NO AGREEMENT

7. Please characterize your relationship with other appointed and elected officials for the constituency you felt you represented on the Board, with respect to CUP policies, during the years you were on the Board. (Please CIRCLE only one number)

   1 EXCELLENT: CLOSE WORKING RELATIONSHIP ON CUP POLICIES

   2 STRONG: MODERATELY CLOSE WORKING RELATIONSHIP ON CUP POLICIES

   3 OK: ROOM FOR IMPROVEMENT

   4 FAIR; OCCASIONAL CONTACT AND DISCUSSION OF CUP POLICIES

   5 POOR: RARE DISCUSSION OF CUP POLICIES WITH THESE INDIVIDUALS

   6 NONE OF THE ABOVE: NOT MUCH NEED FOR CONTACT WITH THESE INDIVIDUALS

8. What would be TWO good reasons for changing to a different technology for water acquisition and/or use? Please put a "1" next to the most important reason, and a "2" next to the second most important reason.

   ____IT WOULD BE MORE COST EFFECTIVE FROM THE USER'S POINT OF VIEW

   ____IT WOULD BE MORE COST EFFECTIVE FROM SOCIETY'S POINT OF VIEW

   ____IT WOULD HELP THE USER TO OBTAIN A CUP, BECAUSE THE DISTRICT STAFF OR GOVERNING BOARD WOULD PREFER THIS TECHNOLOGY

   ____IT WOULD BE A TECHNOLOGY PREFERRED BY RESEARCHERS, SUCH AS THOSE AT UNIVERSITIES

   ____IT WOULD BE A TECHNOLOGY PREFERRED BY PEOPLE IN THE USER'S CATEGORY (PUBLIC SUPPLY, INDUSTRIAL, AGRICULTURAL, OTHER)

   ____IT WOULD BE LIKELY TO CONSERVE WATER

   ____OTHER (PLEASE SPECIFY) ______________________________

   ____

   ____

   ____

   ____

   ____

9. How IMPORTANT are the following criteria in deciding whether to accept or reject a CUP application? Please CIRCLE the NUMBER associated with your view.

	VERY	SOMEWHAT	NOT MUCH	NOT AT ALL
Technical criterion, based on information provided by engineers, crop scientists, and other physical/biological (scientific) information..........................	1	2	3	4
Economic criterion, selecting those applicants who demonstrate economic efficiency in their use, and show an ability to generate more economic activity.........	1	2	3	4
Distributive criterion, taking into account the distribution of wealth and influence among competing users.........................	1	2	3	4
My own personal experience, that tells me what seems right.........................	1	2	3	4

10. Please rank the above criteria from 1 to 4, with 1 being MOST important and 4 being LEAST important.

Technical Criterion__________

Economic Criterion__________

Distributive Criterion_______

Personal Experience__________

11. (a) All three consumptive use categories (agricultural, industrial, and public supply) face the SAME DEGREE OF DIFFICULTY in obtaining the amount of water they request on the original CUP application. (Please CIRCLE only one number)

    1 I AGREE ----------> PLEASE PROCEED TO QUESTION 12

    2 I DISAGREE -------> PLEASE ANSWER PART (b)

    (b) Please rank the three classes of users from 1 to 3, with 1 meaning the LEAST difficulty and 3 meaning the MOST difficulty in obtaining the amount of water requested on the original application.

    AGRICULTURAL________

    INDUSTRIAL__________

    PUBLIC SUPPLY_______

12. What are your dates of service on the WMD Board?

    _____ _____ - _____ _____
    Month Year Month Year

13. What is your age?________

14. What is the highest level of education that you have completed? (Please CIRCLE only one number)

    1 LESS THAN 9 YEARS

    2 9 TO 12 YEARS

    3 13 TO 16 YEARS

    4 MORE THAN 16 YEARS

15. What is your primary occupation?____________________________

16. How long have you been in your primary occupation? (Please CIRCLE only one number)

    1 LESS THAN 1 YEAR

    2 1 TO 5 YEARS

    3 6 TO 10 YEARS

    4 11 TO 15 YEARS

    5 MORE THAN 15 YEARS

17. What was your average annual net income from all sources during your dates of service? (Please CIRCLE only one number)

- 1 LESS THAN $10,000
- 2 $10,001 TO $20,000
- 3 $20,001 TO $30,000
- 4 $30,001 TO $40,000
- 5 $40,001 TO $50,000
- 6 MORE THAN $50,000

Please return the questionnaire in the enclosed postage-free envelope. Thank you very much for your assistance.

Sincerely,

Gary D Lynne

Gary D. Lynne
Associate Professor
University of Florida

Michael E. Wilson

Michael E. Wilson
Graduate Research Assistant
University of Florida

APPENDIX C
SURVEY INSTRUMENT:
WATER MANAGEMENT DISTRICT
CONSUMPTIVE USE PERMIT STAFF

1. Please CIRCLE the NUMBER associated with your view on each of the following statements.

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
The CUP system is not needed	1	2	3	4	5
The Water District acts more as a useless "bureaucracy" than as an agency to serve the people	1	2	3	4	5
Rapid population growth is good, and water should be used to help such growth	1	2	3	4	5
Water will be scarce in parts of Florida before the end of this century	1	2	3	4	5
The latest water conserving technology should be required of all applicants, even if profits are lower	1	2	3	4	5
The future financial/economic benefits of a water permit are great enough to justify spending time and money to get a CUP today	1	2	3	4	5
If you have more power, influence in the community, or higher social status, it is easier to get a CUP	1	2	3	4	5
Water supply authorities, which represent groups of towns, cities, or counties, get CUPs more easily than individual applicants	1	2	3	4	5
The procedures used in applying for a CUP are clear and logical	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDE-CIDED	DIS-AGREE	STRONGLY DISAGREE
Getting a CUP now is important because of future competition for available water...............	1	2	3	4	5
The District staff is fair in its recommendations to the Governing Board, as to who should get a CUP..........	1	2	3	4	5
The District Governing Board is fair in assigning CUPs.....	1	2	3	4	5
An applicant with higher income can get a CUP more easily than someone with lower income.................	1	2	3	4	5
Getting a CUP is the same as staking a claim in the future economic activity of Florida...................	1	2	3	4	5
Requesting only the amount of water actually needed is the best strategy for getting a CUP................	1	2	3	4	5
Large corporations or businesses are more likely to get CUPs than individuals or small businesses......	1	2	3	4	5
The best strategy for getting a CUP is simply to use legal force, even if it leads to confrontation and conflict between the applicant and District staff or Governing Board............	1	2	3	4	5
When the "system" doesn't work, an individual can help by informing administrators, legislators and others in positions of authority so the system can be improved...............	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
CUPs should be given to people who gain the most individual pleasure and satisfaction from the water use	1	2	3	4	5
Success in getting a CUP is due more to strategy and approach than it is to luck and chance	1	2	3	4	5
With the water permit system, the water that one user gains is water that must be given up by another user	1	2	3	4	5
In the past, getting a CUP has been mostly an automatic "rubber-stamp" process	1	2	3	4	5
When applying for a CUP, there is inadequate information about what to expect and the best way to fill out forms	1	2	3	4	5
A CUP application that would result in damage to a neighbor's wells should not be approved	1	2	3	4	5
The District staff really decides who gets a CUP, and not the Governing Board	1	2	3	4	5
Water users have a responsibility toward future generations to avoid damaging the groundwater system	1	2	3	4	5
The Governing Board is OFTEN required to evaluate problems that the District staff cannot see or analyze in CUP applications	1	2	3	4	5

In the questions below, "TERMS" refers to the "TERMS AND CONDITIONS LETTER", which was called the "PROPOSED AGENCY ACTION" starting October 1984. This was the first notification sent to the applicant concerning the District STAFF'S intent (grant the CUP exactly as requested, grant the CUP but in a modified form, or reject the CUP application).

2. What percentage of ALL CUP applicants would contact you BEFORE receiving the TERMS? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

3. Of those CUP applicants who are told that the TERMS will be to modify or deny their first application, what percentage would contact you? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

4. Of those CUP applicants who are told that the BOARD plans to modify or deny their application, what percentage would contact you? (Please CIRCLE only one number)

   1 LESS THAN 20 %

   2 21 % TO 40 %

   3 41 % TO 60 %

   4 61 % TO 80 %

   5 81 % TO 100 %

5. Please characterize your working relationship with the Governing Board, with regard to the CUP process, during the years you were on the Staff. (Please CIRCLE only one number)

   1 EXCELLENT; CLOSE WORKING RELATIONSHIP ON CUP MATTERS

   2 STRONG; MODERATELY CLOSE WORKING RELATIONSHIP ON CUP MATTERS

   3 OK; ROOM FOR IMPROVEMENT

   4 FAIR; OCCASIONAL CONTACT AND DISCUSSION OF CUP MATTERS

   5 POOR; RARE DISCUSSION OF CUP MATTERS WITH THESE INDIVIDUALS

   6 NONE OF THE ABOVE; NOT MUCH NEED FOR CONTACT WITH THESE INDIVIDUALS

6. Please characterize how well your views/philosophies agreed with those of the other Staff members, with regard to the CUP process, during the years you were on the Staff. (Please CIRCLE only one number)

   1 VERY CLOSE AGREEMENT

   2 MODERATELY CLOSE AGREEMENT

   3 FAIRLY CLOSE AGREEMENT

   4 LITTLE AGREEMENT

   5 NO AGREEMENT

7. Please characterize your working relationship with other District staff, with regard to the CUP process, during the years you were on the Staff. (Please CIRCLE only one number)

   1 EXCELLENT: CLOSE WORKING RELATIONSHIP ON CUP POLICIES

   2 STRONG: MODERATELY CLOSE WORKING RELATIONSHIP ON CUP POLICIES

   3 OK: ROOM FOR IMPROVEMENT

   4 FAIR: OCCASIONAL CONTACT AND DISCUSSION OF CUP POLICIES

   5 POOR: RARE DISCUSSION OF CUP POLICIES WITH THESE INDIVIDUALS

   6 NONE OF THE ABOVE: NOT MUCH NEED FOR CONTACT WITH THESE INDIVIDUALS

8. What would be TWO good reasons for changing to a different technology for water acquisition and/or use? Please put a "1" next to the most important reason, and a "2" next to the second most important reason.

   ____IT WOULD BE MORE COST EFFECTIVE FROM THE USER'S POINT OF VIEW

   ____IT WOULD BE MORE COST EFFECTIVE FROM SOCIETY'S POINT OF VIEW

   ____IT WOULD HELP THE USER TO OBTAIN A CUP, BECAUSE THE DISTRICT STAFF OR GOVERNING BOARD WOULD PREFER THIS TECHNOLOGY

   ____IT WOULD BE A TECHNOLOGY PREFERRED BY RESEARCHERS, SUCH AS THOSE AT UNIVERSITIES

   ____IT WOULD BE A TECHNOLOGY PREFERRED BY PEOPLE IN THE USER'S CATEGORY (PUBLIC SUPPLY, INDUSTRIAL, AGRICULTURAL, OTHER)

   ____IT WOULD BE LIKELY TO CONSERVE WATER

   ____OTHER (PLEASE SPECIFY) ______________________________

   ____

   ____

   ____

   ____

   ____

9. In terms of recommendations to the Governing Board, how IMPORTANT are the following criteria in deciding whether to accept or reject a CUP application? Please CIRCLE the NUMBER associated with your view.

	VERY	SOMEWHAT	NOT MUCH	NOT AT ALL
Technical criterion, based on information provided by engineers, crop scientists, and other physical/biological (scientific) information..........................	1	2	3	4
Economic criterion, selecting those applicants who demonstrate economic efficiency in their use, and show an ability to generate more economic activity.........	1	2	3	4
Distributive criterion, taking into account the distribution of wealth and influence among competing users..........................	1	2	3	4
My own personal experience, that tells me what seems right.........................	1	2	3	4

10. Please rank the above criteria from 1 to 4, with 1 being MOST important and 4 being LEAST important.

Technical Criterion__________

Economic Criterion___________

Distributive Criterion_______

Personal Experience__________

11. (a) All three consumptive use categories (agricultural, industrial, and public supply) face the SAME DEGREE OF DIFFICULTY in obtaining the amount of water they request on the original CUP application. (Please CIRCLE only one number)

    1 I AGREE ----------> PLEASE PROCEED TO QUESTION 12

    2 I DISAGREE -------> PLEASE ANSWER PART (b)

    (b) Please rank the three classes of users from 1 to 3, with 1 meaning the LEAST difficulty and 3 meaning the MOST difficulty in obtaining the amount of water requested on the original application.

    AGRICULTURAL________

    INDUSTRIAL__________

    PUBLIC SUPPLY_______

12. Please list positions you have held as a staff member at the SWFWMD, and dates of service in those positions.

Position Title	Dates of Service
____________________	_____ _____ - _____ _____ Month Year Month Year
____________________	_____ _____ - _____ _____ Month Year Month Year
____________________	_____ _____ - _____ _____ Month Year Month Year
____________________	_____ _____ - _____ _____ Month Year Month Year

13. What is your age?__________

14. What is the highest level of education that you have completed? (Please CIRCLE only one number)

    1 LESS THAN 9 YEARS

    2 9 TO 12 YEARS

    3 13 TO 16 YEARS

    4 MORE THAN 16 YEARS

Please return the questionnaire in the enclosed postage-free envelope. Thank you very much for your assistance.

Sincerely,

Gary D Lynne	Michael E. Wilson
Gary D. Lynne	Michael E. Wilson
Associate Professor	Graduate Research Assistant
University of Florida	University of Florida

APPENDIX D
SURVEY INSTRUMENT: IMPROVED VERSION FOR CONSUMPTIVE USE PERMIT APPLICANTS

The survey instrument, which provided all of the primary data used in the study, was a first attempt at eliciting views and other data concerning the process of interest. It was anticipated that flaws in the design of the instrument would become apparent as the study progressed.

For example, some data sought on the questionnaire were already present in the secondary data base. Some of the questions were ordered inappropriately. The phraseology of some questions was either inexact or too complex. The move to a PAA/FAA system caused some difficulties in presentation of questions.

By definition, the processes involved were incompletely understood by the present author when the study began, and this undoubtedly created some questionnaire design problems. As Sheatsley points out, concerning questionnaire construction and item writing, "the very fact that we are studying something means we do not know it all and thus cannot conceive of all possibilities" [1983, 201]. Since research is a learning experience, difficulties that arose in the design of the survey instrument were noted, and the questionnaire was partly rewritten. An improved version of the instrument for CUP applicants is presented at this point, in the hope that future research endeavors may benefit from the present author's experience. Francis Bacon wrote, "Truth will sooner come out from error than from confusion" [Spedding *et al*., 190-?, 210].

It would appear that there are at least five issues to consider in dealing with survey biasedness: the sampling design, the survey contents, the survey responses, the presentation of the survey results, and the context in which the survey is conducted.

The first issue to be addressed is that of sampling design. A non-proportional stratified random sample was used, as indicated in Tables 3 and 4. The anticipated response rate was 60 percent or more in all three groups of CUP applicants (AGR, IND, and PUB). Samples of 10, 40, and 15 percent were taken from AGR, IND, and PUB, respectively. Higher proportions were used in IND and PUB in order to provide at least 30 responses in each of these groups, for statistical purposes. It was expected that well over 30 responses would be received from the AGR group, given 335 mailings in a 10 percent sample of AGR.

The second issue is that of survey contents. This is especially important in question 1, which treats of attitudes. One may categorize each of the 27 parts of question 1 as positive, neutral, or negative in orientation toward the WMD or the "system" in general. One interpretation is shown in Table 68; this is of course not definitive, and is a matter of individual perception. The result is four positive statements, 18 neutral statements, and five negative statements. This indicates a negative bias, but only to a slight degree. The ordering of statements could be improved, and the revised questionnaire shows changes in both form and substance.

The third issue is that of survey responses. There are only three possible a priori attitudes toward the WMD, in terms of how respondents and non-respondents in the present survey regard WMD structure, conduct, and/or performance: (1) a positive attitude, (2) a neutral or undecided attitude, and (3) a negative attitude. It was not anticipated that phraseology within the instrument could significantly alter these a priori views.

By examining Table 44, it can be seen that 22 of the 27 parts show no remarkable disagreement among the respondent groups. It would seem that these groups are in general agreement on almost every part of question 1, with only slight differences existing for five parts. As a matter of fact, it is interesting to note that if individuals had wished to strongly criticize the WMD system, they had the opportunity, but apparently did not return the questionnaire for some reason.

The fourth issue is that of presentation of survey results. In the present case, Tables 17 through 43 disclose

Table 68. Orientation or bias regarding the WMD or the "system", in survey question 1, parts 1-27.

	Orientation of Statement		
Part	Positive	Neutral	Negative
1			1
2			1
3		1	
4		1	
5		1	
6		1	
7		1	
8		1	
9	1		
10		1	
11	1		
12	1		
13		1	
14		1	
15		1	
16		1	
17			1
18	1		
19		1	
20		1	
21		1	
22			1
23			1
24		1	
25		1	
26		1	
27		1	

the details of the responses to the 27 parts of question 1, in terms of frequency and percent, by AGR, non-AGR, and District respondent groups. Table 44 is also included to indicate the number of observations, mean, standard deviation, and Duncan grouping for each of the 27 parts, again by respondent group.

The last issue is that of the context in which the survey is conducted. Since very few statements or questions are totally devoid of all normative content, it is difficult to always forsee when and where biasedness will arise. Space, time, and the respondent population may affect the issue of biasedness. For example, questions concerning specific support programs would likely involve different bias problems when presented to farmers in Minnesota and Florida, or to farmers and legislators, or to farmers in different months with different market conditions prevailing.

A comment on survey methodology for use within regulatory agencies is in order. In the present investigation, advance explanation concerning the survey instrument was not provided to appropriate regulatory officials. It would have been preferable to consult with these officials, and thus prepare them for the mail survey that was to follow. Additionally, all pretests of survey instruments should be signed and dated, as part of the review process prior to the mailing. These may be minor points, but they should prove helpful in future investigations.

1. Please CIRCLE the NUMBER associated with your view on each of the following statements.

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
Water will be scarce in parts of Florida before the end of this century	1	2	3	4	5
Population growth above the present level in Florida is good, and water should be used to help such growth	1	2	3	4	5
The future financial/ economic benefits of a water permit are great enough to justify spending time and money to get a CUP today	1	2	3	4	5
Getting a CUP is the same as staking a claim in the future economic activity of Florida	1	2	3	4	5
Getting a CUP now is important because of future competition for available water	1	2	3	4	5
With the water permit system, the water that one user gains is water that must be given up by another user	1	2	3	4	5
The latest water conserving technology should be required of all applicants, even if profits are lower	1	2	3	4	5
Water users have a responsibility toward future generations to avoid damaging the groundwater system	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDE-CIDED	DIS-AGREE	STRONGLY DISAGREE
CUPs should be given to people who gain the most individual pleasure and satisfaction from the water use....................	1	2	3	4	5
A CUP application that would result in damage to a neighbor's wells should not be approved........	1	2	3	4	5
If you have more power, influence in the community, or higher social status, it is easier to get a CUP........	1	2	3	4	5
Water supply authorities, which represent groups of towns, cities, or counties, get CUPs more easily than individual applicants.........	1	2	3	4	5
An applicant with higher income can get a CUP more easily than someone with lower income..................	1	2	3	4	5
Large corporations or businesses are more likely to get CUPs than individuals or small businesses......	1	2	3	4	5
Success in getting a CUP is due more to strategy and approach than it is to luck and chance............	1	2	3	4	5
Requesting only the amount of water actually needed is the best strategy for getting a CUP.................	1	2	3	4	5
The best strategy for getting a CUP is simply to use legal force, even if it leads to confrontation and conflict between the applicant and District staff or Governing Board............	1	2	3	4	5

	STRONGLY AGREE	AGREE	UNDE-CIDED	DIS-AGREE	STRONGLY DISAGREE
In the past, getting a CUP has been mostly an automatic "rubber-stamp" process	1	2	3	4	5
The procedures used in applying for a CUP are clear and logical	1	2	3	4	5
When applying for a CUP, there is inadequate help on what to expect and the best way to fill out forms	1	2	3	4	5
The District staff is fair in its recommendations to the Governing Board	1	2	3	4	5
The District Governing Board is fair in assigning CUPs	1	2	3	4	5
The District staff really decides who gets a CUP, and not the Governing Board	1	2	3	4	5
The Governing Board is OFTEN required to evaluate problems that the District staff cannot see or analyze in CUP applications	1	2	3	4	5
The CUP system is not really needed	1	2	3	4	5
The Water Management District system is not really needed	1	2	3	4	5
When the "system" doesn't work, an individual can help by informing administrators, legislators and others in positions of authority so the system can be improved	1	2	3	4	5

LET'S LOOK AT THE ACTIONS YOU NEEDED TO TAKE TO GET A CONSUMPTIVE USE PERMIT (CUP).

2. Whom did you contact for help before you gave your application to the District? (Please CIRCLE all numbers that apply)

1 I DID NOT CONTACT ANYONE

2 ANOTHER USER LIKE ME

3 FAMILY MEMBERS

4 COUNTY EXTENSION AGENT

5 WATER MANAGEMENT DISTRICT STAFF MEMBER

6 OTHER (PLEASE SPECIFY) ______________________________

____

3. Whom did you contact for help after you gave your application to the District? (Please CIRCLE all numbers that apply)

1 I DID NOT CONTACT ANYONE

2 ANOTHER USER LIKE ME

3 FAMILY MEMBERS

4 COUNTY EXTENSION AGENT

5 WATER MANAGEMENT DISTRICT STAFF MEMBER

6 OTHER (PLEASE SPECIFY) ______________________________

____

4. Did you waive the 120-day time limit for the application process, to give yourself or the District more time?
(Please CIRCLE only one number)

1 YES

2 NO

5. Did you feel that it was necessary to overestimate the amount of water needed to get what you wanted?
(Please CIRCLE only one number)

1 YES

2 NO

6. Did you attend any District meetings?
(Please CIRCLE only one number)

1 YES (HOW MANY MEETINGS: ______)

2 NO

7. What CHANGES did YOU make on the CUP application?
(Please CIRCLE only one number)

1 I DID NOT CHANGE THE APPLICATION AT ALL

2 I MADE THE FOLLOWING CHANGES ON THE APPLICATION:
(PLEASE SPECIFY) ______________________________
____
____
____
____
____
____

8. What CHANGES did the Water District GOVERNING BOARD make on your final permit? (Please CIRCLE only one number)

1 THEY DID NOT CHANGE THE FINAL PERMIT AT ALL

2 THEY MADE THE FOLLOWING CHANGES ON THE FINAL PERMIT:
(PLEASE SPECIFY) ______________________________
____
____
____
____

3 I DON'T KNOW

9. Did you take further action? (Please CIRCLE only one number)

1 YES (PLEASE SPECIFY) ______________________________
____
____
____
____

2 NO

NOW LET'S LOOK AT WHAT IT COST YOU TO GET THE CUP.

10. How much time did you and other members IN YOUR ORGANIZATION (partners, family, employees) spend, in days, preparing for and actually working to get the permit, including attendance at District meetings? (Please CIRCLE only one number)

1 1 DAY OR LESS

2 2 TO 7 DAYS

3 8 TO 14 DAYS

4 MORE THAN 14 DAYS

11. How much did this cost you, or your employer, in lost productivity and out-of-pocket costs? (Please CIRCLE only one number)

1 $100 OR LESS

2 $101 TO $500

3 $501 TO $1000

4 $1001 TO $2000

5 MORE THAN $2000

12. If you had help from OUTSIDE YOUR ORGANIZATION, what was the total cost of this assistance? (Please CIRCLE only one number)

1 $0

2 $1 TO $200

3 $201 TO $500

4 $501 TO $1000

5 $1001 TO $2000

6 OVER $2000

13. Who did you think would be your "competition" for water, under the existing system of water management?
(Please CIRCLE all numbers that apply)

1 I DIDN'T THINK THERE WAS ANY "COMPETITION"
2 PUBLIC SUPPLY USERS
3 AGRICULTURAL USERS
4 NON-AGRICULTURE INDUSTRIAL USERS
5 RECREATION/TOURISM
6 WILDLIFE, NATURAL SYSTEMS
7 REGIONAL WATER SUPPLY AUTHORITIES
8 THE WATER MANAGEMENT DISTRICT
9 OTHER (PLEASE SPECIFY) ____________________
____
10 I DON'T KNOW

14. What would be TWO good reasons for you to change your present methods related to water (pumping, storage, irrigation, purification, etc.)? Please put a "1" next to the most important reason, and a "2" next to the second most important reason.

____IT WOULD BE MORE COST EFFECTIVE FROM MY POINT OF VIEW
____IT WOULD BE MORE COST EFFECTIVE FROM SOCIETY'S POINT OF VIEW
____IT WOULD HELP ME TO OBTAIN A CUP, BECAUSE THE DISTRICT STAFF OR GOVERNING BOARD WOULD PREFER THIS TECHNOLOGY
____IT WOULD BE A TECHNOLOGY PREFERRED BY RESEARCHERS, SUCH AS THOSE AT UNIVERSITIES
____IT WOULD BE A TECHNOLOGY PREFERRED BY PEOPLE IN MY WATER USE CATEGORY (PUBLIC SUPPLY, INDUSTRIAL, AGRICULTURAL, OTHER)
____IT WOULD BE LIKELY TO CONSERVE WATER
____OTHER (PLEASE SPECIFY) ____________________
____
____
____
____

15. How long has your business or agency been in operation?
(Please CIRCLE only one number)

1 LESS THAN 10 YEARS

2 11 TO 20 YEARS

3 21 TO 30 YEARS

4 MORE THAN 30 YEARS

16. What is the highest level of education COMPLETED BY THE PERSON WHO ACTUALLY FILLED OUT THE CUP APPLICATION?
(Please CIRCLE only one number)

1 LESS THAN 9 YEARS

2 9 TO 12 YEARS

3 13 TO 16 YEARS

4 MORE THAN 16 YEARS

5 I DON'T KNOW

17. Which of the following best describes the business or agency that has this CUP? (Please CIRCLE only one number)

1 A BUSINESS OWNED BY ONE PERSON OR FAMILY

2 A PARTNERSHIP, CORPORATION, OR OTHER JOINTLY OWNED BUSINESS

3 A GOVERNMENTAL UNIT, SUCH AS A MUNICIPALITY, COUNTY, OR REGIONAL WATER SUPPLY AUTHORITY

18. IF YOU ANSWERED 1 OR 2 IN QUESTION 16:
What was the business GROSS income in 1984, related to the water on this CUP? (Please CIRCLE only one category)

IF YOU ANSWERED 3 IN QUESTION 16:
What was the 1984 budget in the agency responsible for obtaining this CUP? (Please CIRCLE only one category)

LESS THAN $20,000

$20,001 TO $40,000

$40,001 TO $60,000

$60,001 TO $80,000

$80,001 TO $100,000

$100,001 TO $150,000

$150,001 TO $200,000

$200,001 TO $500,000

$500,001 TO $1,000,000

MORE THAN $1,000,000

19. Has this CUP been transferred to someone else?
(Please CIRCLE only one number)

1 YES-------> PLEASE STOP HERE

2 NO

20. Have you ever used any of the water permitted on your CUP?
(Please CIRCLE only one number)

1 YES

2 NO

21. Do you expect to renew this CUP? (Please CIRCLE only one number)

1 YES

2 NO

3 I DON'T KNOW

Please return the questionnaire in the enclosed postage-free envelope.
Thank you very much for your assistance.

Sincerely,

Gary D. Lynne	Michael E. Wilson
Associate Professor	Graduate Research Assistant
University of Florida	University of Florida

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BIOGRAPHICAL SKETCH

Mr. Wilson was born inauspiciously on November 2, 1948, in Trenton, New Jersey, just in time for dinner. He briefly reflected upon the state of affairs of the world, then set out to see what mischief he could create, hoping to add in a measurable way to the confusion that was already extant. He moved to Philadelphia, Pennsylvania, when he was two years old, and brought his parents with him. After residing in and around that great metropolis for several years, he and his family relocated to the Washington, D.C., area.

The University of Maryland in College Park realized that it had its institutional hands full soon after Mr. Wilson matriculated there in the fall of 1966. He graduated with a B.S. in zoology in June 1970 and found that Uncle Sam was in dire need of his services. After completing a glorious military career, he returned to graduate school in 1974 at his old alma mater, working and pursuing a master's degree simultaneously. Upon completing an M.S. in dairy science (reproductive physiology), he moved to Florida and soon began his doctoral program in Gainesville. Florida is not expected to recover.

Mr. Wilson enjoys bicycle riding, tennis, and swimming, and is single and care-free at present.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Gary D Lynne
Gary D. Lynne, Chairman
Associate Professor, Food and Resource Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Max R. Langham
Max R. Langham
Professor, Food and Resource Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Joseph W. Milon
Associate Professor, Food and Resource Economics

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Jerome W. Milliman
Jerome W. Milliman
Professor, Economics

This dissertation was submitted to the Graduate Faculty of the College of Agriculture and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December 1986
Jack L. Fry
Dean, College of Agriculture

Dean, Graduate School